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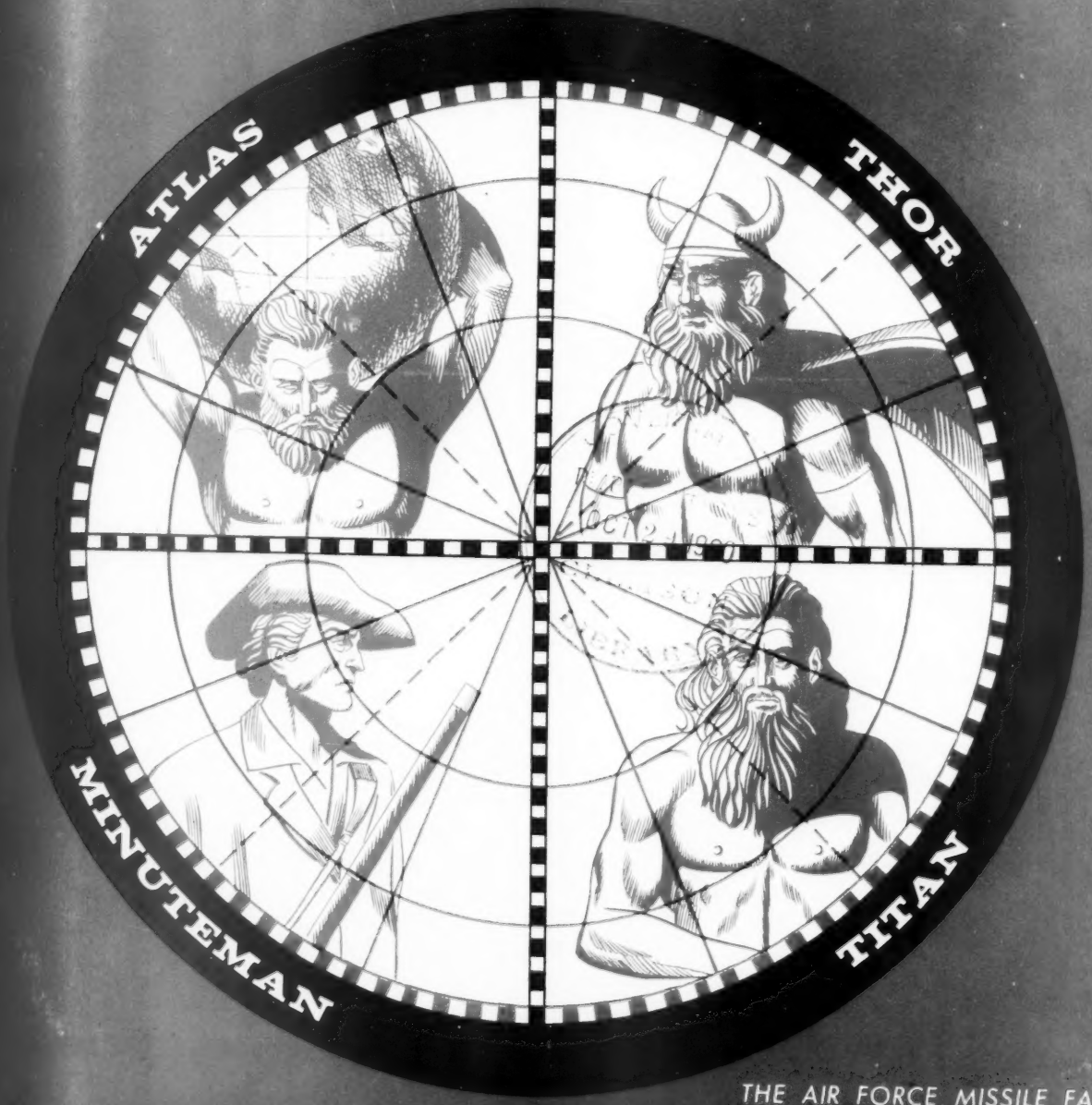
NOVEMBER 1960

THE Airman

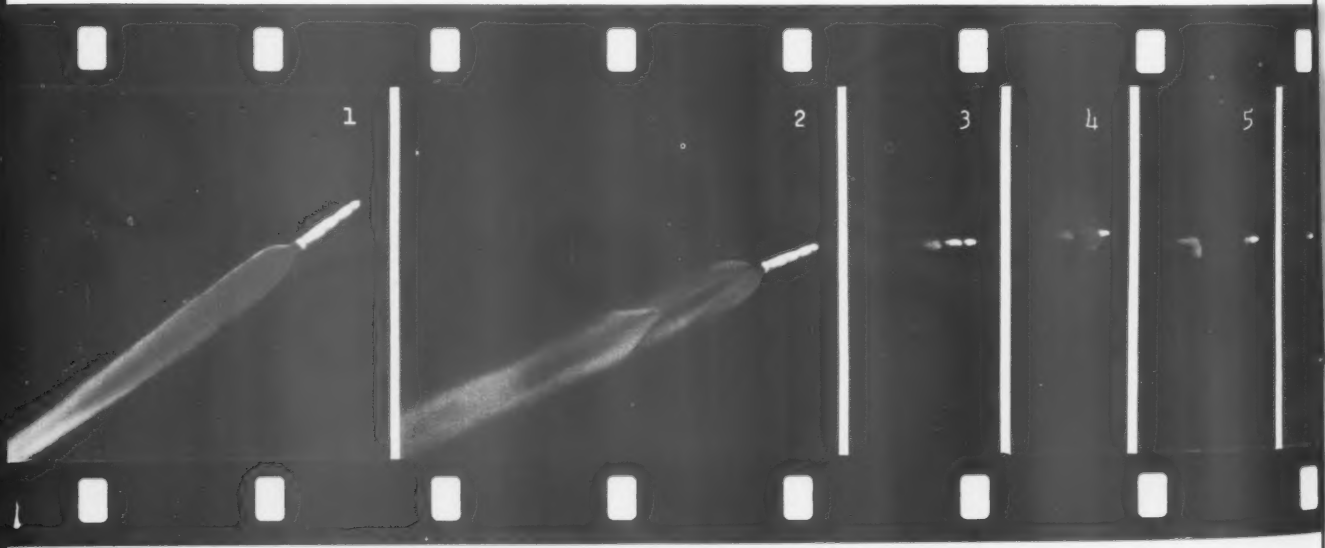
OFFICIAL JOURNAL OF THE AIR FORCE



THE AIR FORCE MISSILE FAMILY
page 21

ROTI *keeps the record*

Roaring into space, an Air Force Titan *ICBM: (1) blasts into the heavens at about 25 miles above Cape Canaveral; (2) reaches first stage burn out; (3) separates first and second stages; (4) ignites second stage; and (5) charges away from main body to reach a range (6) more than 52 miles from the camera. Still climbing and traveling spaceward at nearly 5,000 miles an hour, it speeds its Avco re-entry vehicle into the downrange splash net. Sequence was captured by a special giant camera known as ROTI (Recording Optical Tracking Instrument). Operated by RCA under contract to the U. S. Air Force, the ROTI is basically a 24-inch telescope with a 500-inch focal length lens system coupled to a 70 millimeter camera with a film capacity of 1,000 feet. Two ROTI units are operated at Cape Canaveral and one down range. ROTI film sequences are used for missile performance evaluation.*



THE Airman

OFFICIAL JOURNAL OF THE AIR FORCE

Volume IV, Number 11 November 1960

Director of Information, Office of the Secretary of the Air Force, Maj. Gen. ARNO H. LUEHMAN. *Chief, Internal Information,* Col. ROGER B. PAYNE. *Editor,* Lt. Col. HARMON H. HARPER. *Assistant Editor,* Maj. ROBERT J. FLANAGAN. *Executive Editor,* TED R. STURM. *Departmental Editor,* SMSgt. HAROLD E. BAMFORD. *Art Director,* SMSgt. LESTER B. BOUNDS. *Production and Distribution,* RUSSELL M. WOODS.

USAF PERIODICAL 30-15

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Editorial Office: THE AIRMAN, Room 2-206 Tempo E, 4th and Adams Drive, S. W., Washington 25, D. C. Telephone, OXford 6-7393.

THE AIRMAN is primarily a medium for the exchange of ideas and information among Air Force personnel. Readers are encouraged to submit articles, short subjects, photographs, and artwork.

Use of funds for printing this publication approved by the Secretary of the Air Force and the Director of the Bureau of the Budget, June 9, 1959.

LETTERS TO THE EDITOR

Suggestions

Sir: I would like to see more articles along the same lines as *Are You Being Gypped?* which appeared in the July issue. I think that if these facts were presented to the personnel of USAF and then weighed against the advantages of airman's deposits, bonds, mutual funds, credit unions and similar enterprises, we would have much less trouble with these business "sharpers."

MSgt. Barclay Jones
Stony Brook AFS, Mass.

Sir: I would like to see THE AIRMAN run an article concerning the origin of many of our military terms. Particularly interesting would be the evolution of the term "sergeant." References are made to this title as early as the writings of Cato and Antony when references were made to bands of men under servants who were called sergeant. Whenever one of these thought he was a better leader or warrior than those above him, he challenged his superior to a duel to the death. Thus were promotions made. I'm sure there must be additional information which would be interesting to everyone concerned.

SSgt. Emerson Rutherford
College Station, Tex.

• *Could this be the answer to frozen career fields?*

★ ★ ★

Reserve Request

Sir: I note that you have run several articles in past issues on the Air Force conservation program. Several of our local Reservists have asked if there is any Air Force Specialty in this field. Could you please clarify this for us?

Capt. Bettie J. Hunt
Ann Arbor, Mich.

• *At present, there is no AFSC which covers this field. Currently, the conservation program is generally administered by the provost marshal's office, and most of the personnel directly connected with the program are assigned within this category. A study is presently being conducted on the feasibility of establishing such an AFSC.*

★ ★ ★

(Continued on next page)

LETTERS TO THE EDITOR, *continued*

Congratulations

Sir: I would like to thank the editors and TSgt. John K. O'Doherty for the excellent job on the two stories treating with the activities of the Veterinarian Service here in the Azores. (*Episode on Terceira,* July, and *White Tide on Terra Nostra,* August.) Both were accurate and well-presented.

Capt. Anton A. Kammerlocher
APO, New York, N. Y.

Sir: On behalf of the members of our local CAP squadron, I would like to say thank you for a fine overall magazine. You have yet to disappoint us with your quality.

Bill Appel
Erlanger, Ky.

★ ★ ★

RAF Readers

Sir: Thank you very much for your kind permission to reprint *The Care and Feeding of Flight Instructors* in our forthcoming *RAF Annual.* A copy of this, of course, will be sent you.

I am very grateful to you, too, for the copies of THE AIRMAN which I am reading with much interest. I do congratulate you and your colleagues on this most polished publication. It is undoubtedly a great credit to your service and must be extremely popular.

Again, my warm thanks for your prompt cooperation.

P. D. Breen, Editor
Royal Air Force Association Annual

★ ★ ★

Firefighters

Sir: As a training NCO for National Guard firefighters, I believe the photo which appeared at the top of page 25 in your *Realism and Rubber Boots* article in August is a poor illustration of firefighting techniques.

SSgt. Gerald Engel
Brooklyn, N. Y.

Sir: At long last I have found something in THE AIRMAN which is in error. The photo on page 25 serves as a very poor example to firemen, called upon to fight a crash fire. The men are improperly "geared" and bunkered—sins which are unforgiveable in this line of work.

James E. Maynard
Orlando, Fla.

Sir: The picture at the top of page 25 must have been posed. I feel sure that no firefighter, in his right mind, would attempt to battle an aircraft blaze in the manner indicated in this shot.

SSgt. Fred G. Farley
Altus, Okla.

• *To firemen throughout the Air Force who wrote regarding the picture in question, the editors apologize. It was taken from our files and depicts a training exercise of some years ago as is indicated by the old type stripes one of the men is wearing. The critized photo was substituted for the one above which was received from Scott AFB, Ill., with the original story. The editors regret the selection and feel certain, from the volume of mail, that USAF firefighters of today are better trained and better equipped than were their predecessors.*

The General's Commission

Sir: In various publications, I have seen several versions of the source of Gen. Curtis LeMay's commission. Can you clarify this for me?

SSgt. W. W. Ramsey
Newark, N. J.

• *According to both General LeMay's 201 file and his official biography, he completed four years ROTC training at Ohio State University and was commissioned a second lieutenant in the Field Artillery on June 24, 1928, but later transferred to the Air Force.*

★ ★ ★

Conversion

Sir: Following a recent transfer, I was informed that I would have to retrain from my former AFSC of 25270 (Airborne Weather Equipment Technician) to 25251 (Weather Observer), and that eventually my 25270 would be deleted from my records. Do I have any recourse to prevent such action?

SSgt. Dan G. Hern
APO 243, New York, N. Y.

• *According to officials in DCS/Personnel, Hq USAF, action has been initiated to convert all airborne weather equipment technicians into this new AFSC. In short, the 25270 field is being eliminated from Air Force categories. Full details are contained in Change C, AFM 35-1, 30 Sept. '60.*

★ ★ ★

Question

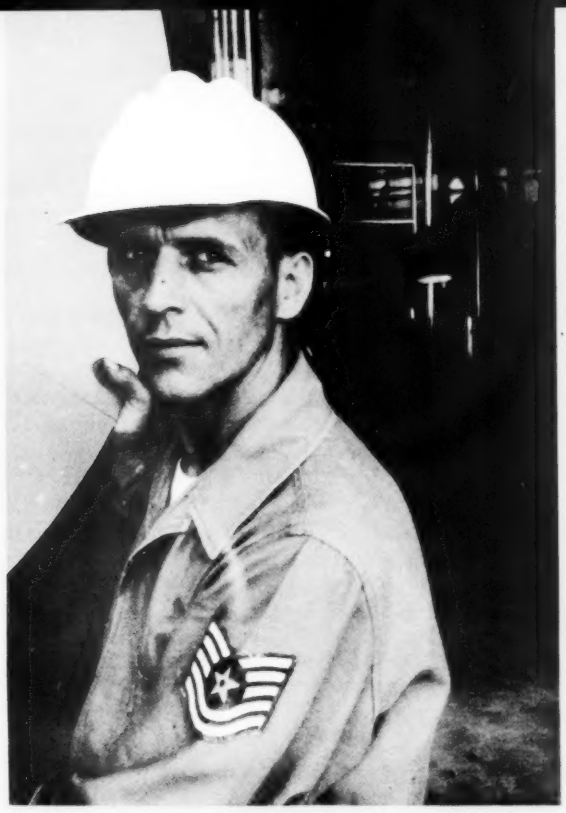
Sir: My wife and I recently traveled to Colorado for our vacation and during our stay there went atop Pikes Peak. The weather was very bad and I did not notice an Air Force aircraft parked there until we had already begun our descent. Can you give me any details relative to this plane?

George S. Kessler
Oradell, N. J.

• *In June 1958, a nonoperational F-94 Starfire was purchased from USAF surplus stocks by the Colorado Springs Air Force Association Squadron and presented to Air Force officials as a monument to be placed on Pikes Peak. It was dismantled, trucked to its present location, and mounted in a concrete base which would aid it in withstanding the winds and weather atop the mountain.*

★ ★ ★

TRAINED AIRMEN FOR MISSILES



A highly accelerated missile training program is insuring an adequate supply of skilled Air Force technicians to fire and maintain the USAF family of missiles now coming into our arsenal.

by Dave Karten, *Airman Staff*

The time is a few minutes before a full-range test flight of an *Atlas* SM-65 (for Strategic Missile). In the windowless outpost Lt. John Pritchard sits listening to the test conductor. As the seconds tick away, he flips the pages of the checklist—the countdown bible—and watches the lights, buttons, and TV monitor.

Lox tanking is completed. Just before zero time the controller calls for final "go/no-go" reports from operators manning individual consoles. "Missile Power" . . . "Go" . . . "RF systems" . . . "Go" . . . "Propulsion" . . . "Go."

The count reaches T minus 10 seconds. A crisp voice shouts: "Ready to launch!" Uninterrupted, the countdown proceeds to "Nine and counting . . ." It dwindles to "five, four, three, two, one." Then: "Main stage!"

The missile doesn't lift off for a dramatic climb into space, yet the launching is a success. For this is part of the realistic training at Air Training Command's sprawling Sheppard AFB in north Texas. Here handpicked airmen are learning to operate and maintain our intercontinental ballistic missiles.

These trainees will man the nation's *Atlas* and *Titan* ICBM squadrons at wartime readiness around the clock. On these earthbound "airmen" and future crews of the fixed-base and mobile *Minuteman*, will rest the responsibility of insuring that USAF retaliatory missile might is at all times "ready to launch."

People Are Vital

Without highly trained technicians to fire and maintain them, missiles are impressive but useless stainless steel cylinders, silent and harmless hunks of metal.

Essentially a weapon system must consist of hardware, facilities, and trained people. Early in the game, when the *Atlas* was being developed under the highest Air Force priority in an all-out effort to provide the U. S. with an operational ICBM, major emphasis was on hardware and facilities—engines, airframes, nose cones, guidance systems, and ground support systems. Research and development concentrated strictly on the hardware. With eyes glued to slide rules scientists and engineers of necessity left the training of people to others. Because missiles posed new and unusual problems, personnel training was slow in starting.

"But today," says an Air Training Command spokesman, "we start planning the training almost as soon as the Air Force starts planning the new missile weapon system. Lead time on skilled missile technicians is now longer than the lead time required to develop new weapon systems. And unless we get into the act early, we just won't come up with the people to man our missiles."

To meet increasing manpower demands as new, more complex missiles roll off production lines, and launching sites are developed, a wholesale but meticulous training program is now going ahead full blast. At

Sheppard, Lowry AFB, Colo., Amarillo AFB, Tex., Keesler AFB, Miss., and Chanute AFB, Ill., several thousand selected officers and enlisted airmen are learning the exacting art of handling technologically sophisticated ballistic missiles.

Lowry is the prime training base for the *Skybolt, Mace, Matador,* and the *Sidewinder.*

Amarillo trains airmen on the *Snark,* the *Quail,* the *Bull Pup* (or *White Lance*), and all the drones.

Keesler, an electronics training center and support base for ground guidance training on ICBMs, is responsible for training on the *Midas* early-warning satellite, the *Tiros* weather surveillance system, and the *Dyna-Soar,* a manned boost-glide space vehicle.

Chanute, a support base for propulsion training on all ballistic missile systems, is training airmen on the *Minuteman, Bomarc,* and the *Hound Dog.*

Sheppard also has prime responsibility for training on *Thor* and *Jupiter* IRBMs but now concentrates on the two ICBMs *Atlas* and *Titan.* A detachment in the U. K. supports the RAF's *Thor* program. A *Jupiter* Field Training Detachment is training NATO allies in the Mediterranean area.

Teaching airmen missilery at USAF bases represents a giant step forward. Until recently the training was accomplished by attendance of 5- and 7-level airmen at specialized courses conducted in the manufacturer's plant. The instructors were company employees. This "Phase 1" factory training provided the Air Force with the initial technicians for ARDC, the required ATC instructors, and technically trained personnel for the first operational missile units.

But factory training has many disadvantages. Airmen must be sent all over the country for training on missile components built by various contractors. On the *Atlas* missile, for example, they were sent to the Convair-Astronautics plant in San Diego, Calif., to study the airframe and autopilot system. They went to North American's Rocketdyne plant at Canoga Park, Calif., for rocket engine training. They received instruction on nose cones from the General Electric Co. at Philadelphia, Pa., and guidance system training from GE in Syracuse, N. Y. Half a dozen other contractors provided training at their factories located clear across the country.

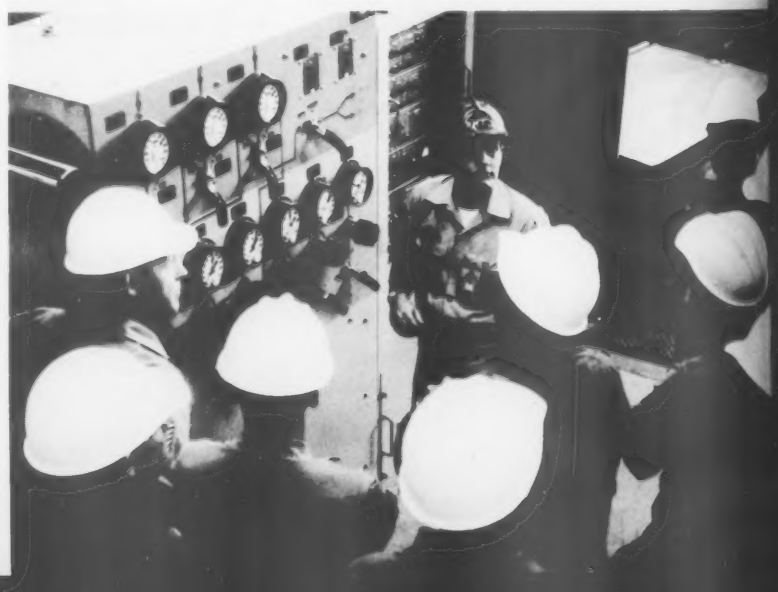
The training by missile contractors was costly. Although factory instruction comprised only three percent of Air Training Command's total training effort in all fields, it took about 20 percent of allocated training funds. In the nine-month period from July 1959 through March 1960, for example, living expenses for airmen training at factories amounted to more than $5 million.

As soon as the Air Force gained sufficient experience, and the capability required in terms of instructors, equipment, and facilities, Air Training Command took over the conduct of these special courses as Phase II training at its own Technical Training Centers and began to provide the necessary trained personnel for the activation of follow-on units. Transfer of the missile training from factories to U. S. Air Force bases brought about substantial savings.

"In the past year," says Brig. Gen. Leo F. Dusard, Jr., Deputy Chief of Staff for Technical Training at Air Training Command Hq, "we have made rapid progress in the development of an Air Force capability to provide training on our complex new missile systems. We're still using a limited number of representatives from the various contractors but mainly as consultants to assure alignment of the courses with the latest technological changes in the missile system."

General Dusard explained that, in keeping with the Air Force philosophy of attaining the earliest possible "in-house" training capability, ATC programmed the initial *Titan* technical training to be conducted at Sheppard with a third of the instructor cadre made up of military personnel. "The same philosophy is now being applied to the *Minuteman* for which initial training will be conducted at Chanute, to the *Skybolt* with initial training at Lowry, and to other Air Force missile weapon systems as they come into the inventory. The idea is to fully utilize the vast teaching and educational experience within the Air Training Command to best advantage."

The training of nearly 800 hand-picked officers and enlisted airmen now going on at Sheppard is a good



NCO instructor conducts class on T-10 trainer console, which realistically simulates operation of thrust section of Atlas *ICBM.*

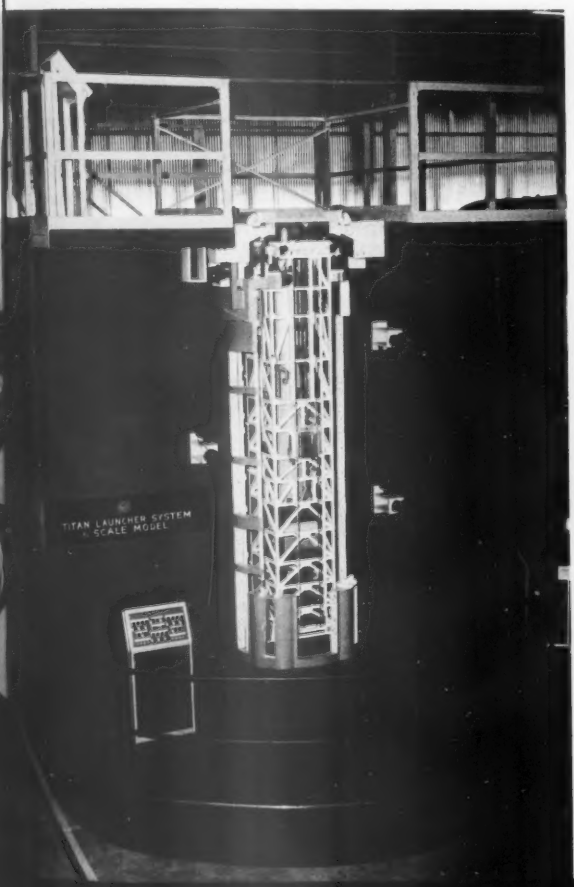
example of this philosophy in action. Sheppard was assigned responsibility for training on the *Atlas* weapon system in the fall of 1955. At the time, one man, Mr. Holger Peterson, began planning and developing the ICBM training program. The Missile Training Department, 28 people by late 1957, 92 by October 1958, now has a staff of 619 including instructors, supervisors, and administrative personnel.

Early in the development stage of the USAF missile program, the decision was made to build a missile training facility at Sheppard AFB, which formerly trained thousands of airmen at its aircraft and engine mechanic's school. The design was completed by mid-1958 and construction began six months later.

The unique facility—the first building in the Air Force conceived for the sole purpose of training missilemen—consists of a large, windowless training structure containing 126 classrooms and laboratories, a huge missile bay area in which several missiles can be placed at one time with sufficient room to conduct training on each "bird" simultaneously, a maintenance building, launch complexes, launch pads, *Atlas* blockhouses and launchers, a *Titan* ground guidance station, and a *Titan* mating-demating trainer where students practice putting the *Titan* into the silo. The missiles are real "birds," the buildings and facilities exactly the same as those at the actual sites.

The Sheppard Missile Training Center covers 300,000 feet of floor space. It was built at a cost of $3 million in a record 270 days. The rapid construction made it possible to begin missile training by October 1959 and accelerate the programmed move of Air Force missile trainees from Convair at San Diego by three months. The center was dedicated November 14, 1959, and named in honor of Col. Neel Ernest Kearby, WW II Medal of Honor hero (See *Cheaper by the Half Dozen,* THE AIRMAN, Dec. 1959) who was killed near Wewak, New Guinea, on March 4, 1944.

This model of Titan *launcher, one-twelfth actual size, is one of many training aids.*



The *Titan* training program was assigned to Sheppard early last year. With Kearby Hall completed, contractor facilities for *Titan* training were not required. The first *Titan* courses began last May. The first class of *Titan* officers graduated last month. Because Air Training Command was unable to have instructors trained in advance of the requirement for SAC operational personnel, the manufacturers of each weapon system were employed to provide the training for both ATC and SAC.

"At present our major contract effort is only on the *Titan* program," says Lt. Col. Abram B. Sheaffer, director of the Missile Training Department, "and we will have a 'blue suit' capability in both the *Titan* and *Atlas* systems in the very near future."

Who Are These Men?

For the most part, trainees at the new center are either veteran Air Force careermen or new recruits fresh out of basic training. Former B-47 hydraulics mechanics receive special training so they will be oriented on the *Atlas* or *Titan* missile hydraulics system. Former pilots and navigators are being turned into maintenance supervisors, or missile operations officers. A *Titan* Guided Missile Operations Officers class will include people like Capt. Bennie Castillo, command pilot who served with the 3200th Electronics Test Squadron at Eglin AFB, Fla., as an Airborne Radar Maintenance Officer. Captain Castillo, selected for *Matador* school training in 1951, literally grew up with the program. Maj. Lee Stubblefield was a pilot in the 17th Air Transport Squadron until he volunteered for the missile program. Lt. Col. George Timms was a B-47 standardization navigator in the 320th Bomb Wing. He volunteered to "fly" the new type "birds." Lt. Val Smith was a flight engineer at Moore AFB, Texas, until he applied for missile training. Lt. Col. Malcolm L. O'Neale, Jr., a pilot and operations staff officer in the 67th Tactical Reconnaissance Wing, was selected for the *Titan* training.

What type of airman makes a good missileman? Prerequisites for the guided missile maintenance officer's course, for instance, include: completion of college-level courses in the theory of electricity and electronics; knowledge of mathematics through differential calculus; a bachelor's degree in electrical, aeronautical or mechanical engineering; and basic knowledge of theory of flight and principles of jet and rocket engines.

Recruits fresh out of basic training who scored high on aptitude tests in electronics math and physics are

given a fundamental course in missiles. After they complete the basic course, students go on to one of the 20 advanced courses on the different phases of the *Atlas* or *Titan*.

Because it takes a team of men to operate a missile squadron, no one student is taught all the functions of the missile. He specializes in one phase of the missile operation or maintenance.

Courses in the *Atlas* and *Titan* programs are in the areas of operations, maintenance, guidance control, electronics, control systems, missile systems analysis, test equipment, repair, hydraulics, electrical repairs, ground support and launch equipment, engines, electrical power, plumbing, and refrigeration. (See accompanying list on page 7).

Students soon learn that there is a big difference between operation and maintenance of aircraft and handling missiles. TSgt. Billy R. Horn, a former C-119, C-123 and F-100 maintenance specialist who now teaches *Titan* missile maintenance, sums it up by telling trainees: "You can take an airplane up for flight tests, bring it down and make the necessary repairs before taking off again. But with these "birds" it's different. Once they take off they're gone, real gone."

The development of the training courses and the training program at Sheppard was a combined effort of Air Training Command, and the Air Force Ballistic Missile Division. Not since the B-29 buildup in WW II had the Air Force been faced with a comparable challenge that had the urgency, criticality, and newness of the missile training program. Numerous and continuing changes in missile design complicated things. Text books on missile operation didn't need to be revised; they hadn't even been written. To keep current, instructors had to start preparing lessons almost "as soon as a gleam came into the designer's eye." They "lived with" the program changes and continuously revised training plans as the changes occurred. The result: quality-trained, equipment-oriented missilemen who can operate our new weapon systems just as soon as they are phased in.

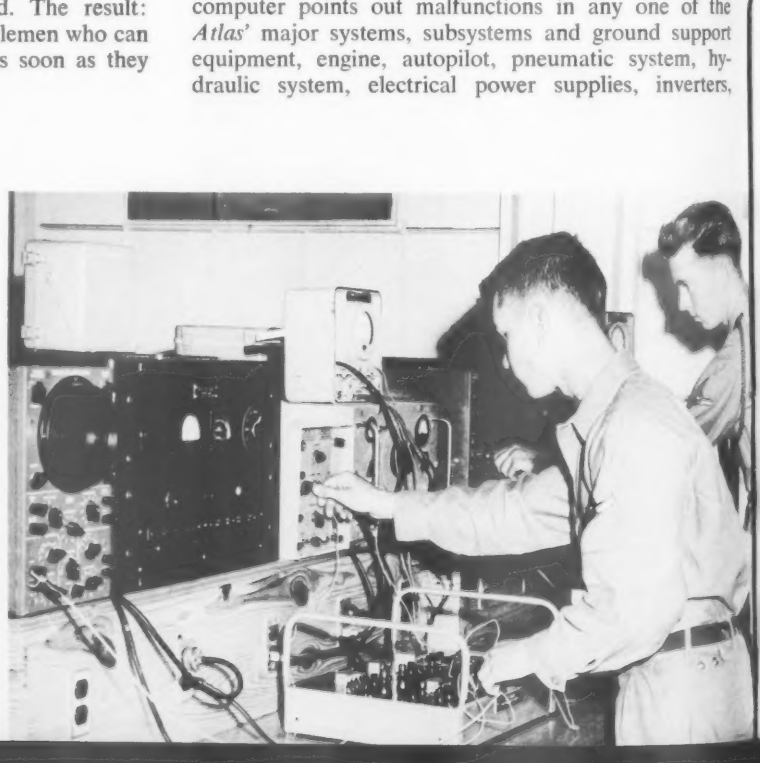
"One of the major problems," says Colonel Sheaffer, "is to obtain specific training equipment in time for each course. Our policy in this area has been to obtain weapon system hardware identical to that found on operational missile sites and supplement it with animated devices and simulators so that the individual trainee will thoroughly understand the equipment he will operate before he arrives at the operational site."

Key Is in Realism

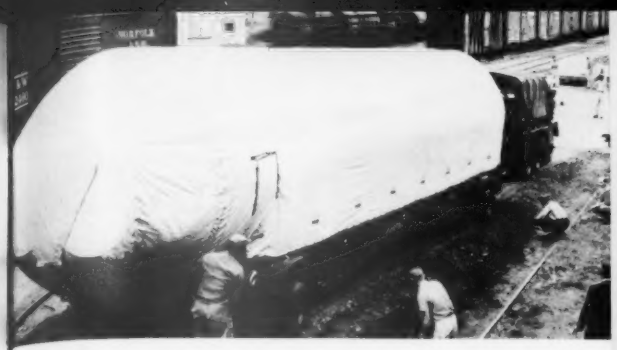
This realistic training is the key to the quality training airmen now receive at Sheppard AFB. Future *Atlas* and *Titan* missileers learn to use the "real thing." In the days of the early training missilemen learned about the birds from mockups and models. When some of them arrived on Formosa to man the *Mace*, they found it difficult to make the distinction between a model and a live "bird." Today Sheppard trainees check, troubleshoot, and "launch" the same real life-size *Atlas* and *Titan* they will handle at the launch site. Conditions are simulated, of course, but right from the start trainees work with the same facilities and equipment they will encounter when they take up active duties.

Shortly after its arrival at the training center the *Atlas* or *Titan* is installed in a horizontal position in the squadron maintenance area, part of a 17-acre enclosed missile area on the northern extreme of the base. Here tomorrow's missile maintenance technicians learn exactly the same maintenance procedures they will be required to use in the field.

The trainee learns to use the APCHE (Automatic Programmed Checkout Equipment) system. This is a highly developed voltmeter that can accomplish in a few minutes the same work it would take one highly trained technician with the necessary equipment months to do. The student missileer feeds decks of tab cards into a master console unit wired to the missile. The computer points out malfunctions in any one of the *Atlas'* major systems, subsystems and ground support equipment, engine, autopilot, pneumatic system, hydraulic system, electrical power supplies, inverters,



Handpicked trainees take course in fundamentals before going on to specialized training in Atlas *or* Titan *ICBMs.*



Shrouded Titan *ICBM arrives at Sheppard AFB for use in the realistic training program.*

guidance system, and then the APCHE checks itself. Other cards can be fed into the unit to pinpoint defects in any of the more than 40,000 parts making up the *Atlas*. And during the training course instructors deliberately create malfunctions for the student to locate and correct.

On the animated T-3 trainer that glows like a Times Square neon sign at night, students actually see the ground portion of the propellant transfer system in action, follow the transfer of propellant in the missile step by step and the entire sequencing of the launcher mechanism during prelaunch and countdown.

Future training plans call for closed circuit television beginning late next year, with cameras scanning missiles in the Sheppard bay area and transmitting pictures to the many classrooms. The practical training through TV will be integrated with textbook theory and instructor training in the classroom.

When the student completes training on the individual skills of his missile specialty at Sheppard, he progresses to Vandenberg AFB, Calif., for integration with the other members of the launch or maintenance crew. At that time his crew is given Operational Readiness Training. In three months training "on the pad" at Vandenberg the missileman learns to work as a member of a team in operating and maintaining the weapon. The team trains toward the goal of launching an ICBM within 15 minutes.

By year's end, the Sheppard Missile Training Center will have taught 1,300 airmen the exacting art of missilery. By next year the number of students in training at the Wichita Falls center will exceed 1,600.

"Time is closing in," says Colonel Sheaffer, "but we're improving our operation every day and will soon have all the *Atlas* and *Titan* equipment for the Air Force specialties of each weapon system. We're aware that the operational capabilities of the Strategic Air Command is directly dependent upon the adequacy of this training and we're going all out to make it quality training. We even have a special Field Training Detachment that checks on trainees; sends back suggestions for improving the tutoring at Sheppard.

What will this mean to the Air Force? Colonel Sheaffer answered the question quickly: "Highly trained missilemen to man the missiles now coming into our arsenal add significant new strength to the nation's deterrent posture."

ATLAS SM65 COURSES

AFSC	TITLE
1824	Guided Missile Operations Officer
3124B	Guided Missile Maintenance Officer
31000	Supervisors & Planners
31270P	Control System Technician/Mechanic
31450P	Guidance System Analyst
31451	Control System Analyst
31470P	Missile System Analyst Technician
31570P	Missile Test Equipment Technician (LC & APCHE)
31570P	Missile Test Equipment Technician (Control System)
31570P	Missile Test Equipment Technician (A/B Guidance)
42152	Missile Hydraulic Repairman/Technician
42153	Missile Ground Support Equipment Technician/Mechanic
42370	Missile Electrical Technician
43350	Missile Maintenance Technician/Mechanic
36251	Dial Central Office Equipment Mechanic/Technician
56150	Electrician/Supervisor (Facility)
56650	Refrigeration Supervisor/Technician
56751	Electrical Power Production Repairman/Technician
56000	Scale and Corrosion Control Maintenance, Start 9 Aug 61
30452	Ground Communications Equipment Repairman/Technician (TV), Start 12 July 61
331X0B	Re-entry Vehicle

TITAN SM68 COURSES

AFSC	TITLE
31000	Supervisors & Planners Anticipated
1824	Guided Missile Operations Officer
3044	Guidance Control Officer (Radio Inertial Guidance System)
3044	Guidance Control Officer (Computer)
3124B	Guided Missile Maintenance Officer
30551	Electronic Digital Data Processing Specialist/Technician
31170P	Guidance System Mechanic/Technician (Radio Inertial Guidance System)
31270P	Control System Technician/Mechanic
31470P	Missile Systems Analyst Technician
31570P	Test Equipment Repairman/Technician (Launch Control)
31570P	Test Equipment Repairman/Technician (Propulsion & Propellants)
36251	Dial Central Office Equipment Mechanic/Technician, Start 30 Nov 60
42152	Missile Hydraulic Repairman/Technician
42153	Missile Ground Support Equipment Mechanic/Technician (Launch Facilities)
42350	Missile Electrical Repairman/Technician
43350	Missile Maintenance Mechanic/Technician
43351	Missile Engine Mechanic/Technician
56000	Scale and Corrosion Control Maintenance
56150	Electrical/Supervisor
56450	Plumber
56650B	Refrigeration Specialist/Supervisor
56751	Electrical Power Production Repairman/Technician

BASIC—TYPE III (CAREER TRAINING)

AFSC	TITLE
31130P	Guidance System Mechanic (SM65, 68)
31130P	Guidance System Mechanic (Ballistic Missile Inertial Guidance), Start 24 May 61
31230P	Control System Mechanic (SM65, 68)
31430P	Missile System Analyst (SM65, 68), Start 25 Jan 61
31530P	Missile Test Equipment Specialist (SM65, 68)
42132	Aircraft & Missile Hydraulic Repairman (Ballistic Missile), Start 29 Mar 61
42133	Aircraft & Missile Ground Service Equipment Repairman (Ballistic Missile), Start 8 Feb 61
42330	Aircraft & Missile Electrical Repairman (Ballistic Missile), Start 22 Mar 61
43330	Missile Mechanic (Ballistic Missile), Start 4 Jan 61
1821/3121B	Guided Missile Maintenance and Operations Officer (Basic), Start 15 Feb 61
1821/3121B	Guided Missile Maintenance and Operations Officer (SM65), Start 10 May 61
1821/3121B	Guided Missile Maintenance and Operations Officer (SM68), Start 31 May 61
56130	Electrician
56430	Plumber
56630A	Refrigeration and Air Conditioning
56630B	Equipment Cooling Specialist
56730	Electric Power Production Operator
56731	Electric Power Production Repairman

Note: Where no starting date is given, the course is in operation.

NEVER LAUGH AT A GOONEY BIRD

by TSgt. John K. O'Doherty
Airman Staff

A NUMBER of newcomers to this aerospace Air Force—notably members of the aristocratic jet interceptor and tactical fighter set—have been heard to make disdainful and patronizing remarks about the Gooney Bird. Oh, they will hasten to deny any bias, these blasé youngsters with their Mach 2 outlook, but an airman's real secret opinion in the matter can often be detected in just the way he pronounces the words "Gooney Bird." If there is no reverence in the tone, no warmth of affection in the formation of syllables, no slight, almost imperceptible, bow of the head, it is virtually certain that the speaker is a Johnny-Come-Lately. He probably believes that Gooney Birds should be hung up in some suitable place out of the way so they won't clutter up the airways and occupy space on the parking ramps.

Fortunately for the interests of justice and fair play, there is another splendid group in the Air Force. It is the receding-hairline-and-distinguished-touch-of-grey-at-the-temples element which is quick to leap to the defense of the Gooney Bird at the first drop of an unkind word. So far as is known these people have no formal organization—like maybe the Loyal and Devoted Order of Gooney Bird Boosters. However, they are united in dedication to complete squelching of iconoclastic critics, whether encountered on flightline, in ops building, or stag room at the club.

There is one single characteristic of the Gooney Bird upon which all factions can reach agreement, however. It is that there have been more lies told about this airplane than any piece of machinery since the invention of the Ark.

Who can be expected, for example, if he is not completely and hopelessly gullible, to swallow the yarn of the Gooney Bird which came to a complete standstill in flight during World War II? There was no crash, not even a ripple of turbulence. The aircraft was flying in the pitch blackness of an African night with landing gear up and engines operating normally. There was a noise like a "swoosh" and suddenly the sound of rushing air faded. The pilot looked at the co-pilot in amazement as all sense of motion ceased.

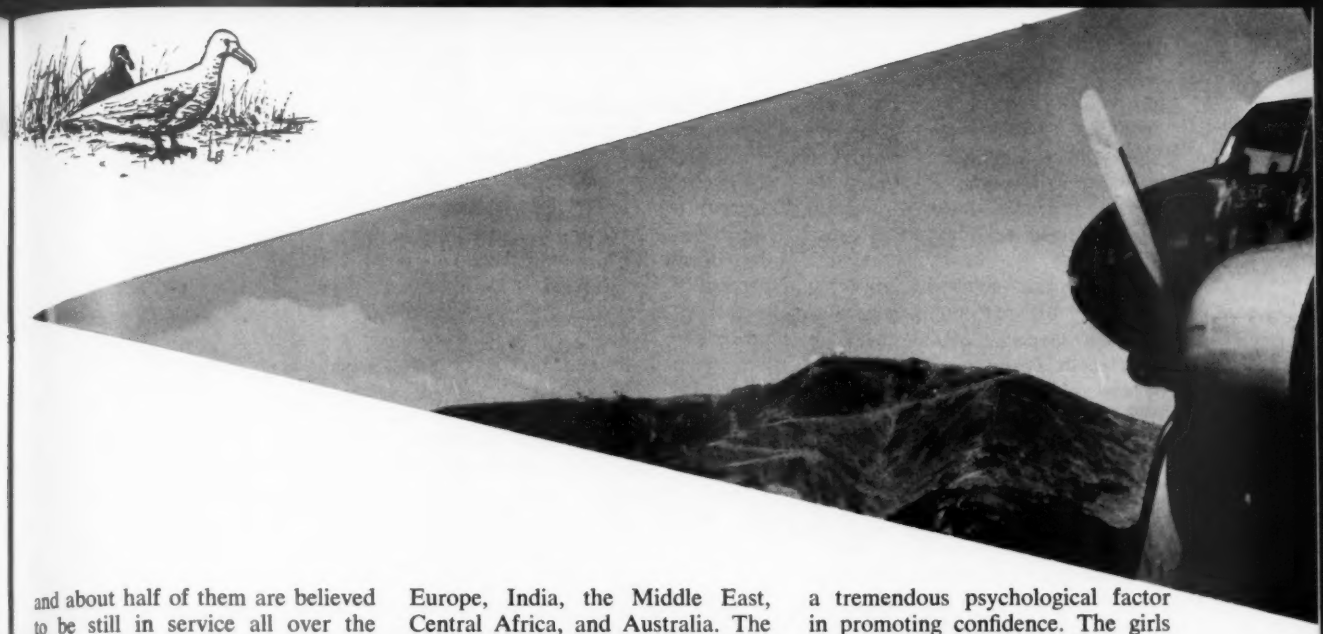
Then there is the story of how the East German police, during the Berlin Airlift, observed a Gooney Bird land easily on a wheat field in the Russian Zone. When they rushed to surround and capture the prize, they were stunned to find no evidence of human occupancy. A small white dog sat in the pilot's seat, alternately licking his paws and yawning in absolute boredom.

Of the great mass of fantastic airpower folklore surrounding the Gooney Bird, a substantial quantity is authenticated by official documents. Another considerable portion is strongly supported by unofficial, but reliable, testimony. Without question the most prejudiced critic and the most fanatical disbeliever must necessarily conclude that a great many of the lies told about the incredible Gooney Bird are true.

When Douglas Aircraft Company produced the first Gooney Bird in 1936, the craft was assigned the dignified name of *Skytrain,* but this early label is seldom heard any more. Commercial users call it the DC-3, and the Air Force lists it as C-47. The Navy, with its talent for being different, calls the Gooney Bird the R4-D, and the British for some unclear reason christened it the *Dakota.* The Russians, who acquired a number through lend-lease during the war, promptly copied it and produced it as their model Li-2 —another Russian invention. A brightly imaginative local airline in the southern United States describes its DC-3s as *Super Starliners.* Probably there are other names in other localities, but the wartime sobriquet of Gooney Bird is known and unambiguously understood in every corner of the world.

The DC-3 was developed by Douglas on the foundation of experience with the DC-1 and DC-2. The DC-1 was strictly experimental, and only one model was built. Howard Hughes strutted as owner of this machine for a spell, but it changed hands shortly and eventually crashed in Spain. Fewer than 150 DC-2s were produced beginning in 1934, as destiny waited for the DC-3 to bring its spectacular revolution to transport aviation.

The first Gooney Bird came off the Douglas assembly line on June 28, 1936, and production of the model was terminated forever in 1946. During that decade, more than ten thousand units were built,



and about half of them are believed to be still in service all over the world. The Air Force has some 1,200 flying in the ZI and overseas commands. They are performing missions ranging all the way from logging 60-2 time to air logistics, courier service, weather reconnaissance, and a number of highly specialized activities.

Minimum age of any existing Gooney is nearly 15 years, but there is no way of knowing how many have reached the maximum of 24 years since 1936. Changes in ownership of civilian aircraft bring changes in registration numbers, and it is difficult to trace the history of particular aircraft over such extended periods. There is good reason to believe, however, that the very first Gooney Bird produced is still in service as the company aircraft for a California lumber concern. The second oldest unit, available evidence would indicate, is still being flown commercially by an airline in the Southwest.

The major American airlines now use only a few Gooneys for short-run local flights, but many of the regional or feeder lines rely heavily on the old reliable vehicle. Altogether there are about 350 in domestic scheduled service in the U.S., and untold scores operated by independent companies or individuals. Overseas, there are numbers of airlines using Gooneys exclusively, and the familiar profile can be seen on airfields all over South America, Europe, India, the Middle East, Central Africa, and Australia. The Russian facsimile serves airlines in Poland and Czechoslovakia. Although an accurate census is hardly possible, a British aviation authority recently estimated that, numerically, about 30 percent of the world's total air transport fleet consists of Gooney Birds.

As originally designed by Douglas engineers, the Gooney Bird was intended for use as a sleeper plane on passenger airlines. The main compartment was fitted with 14 berths and a secluded "bridal suite" up forward, designed, hopefully, to attract honeymooners. A personal account from the first bride to be initiated into the mysteries of marriage at, say, 10,000 feet and 180 miles per hour would, undoubtedly, constitute a document of absorbing interest. Historians, unfortunately, were deplorably lax in failing to provide such a record for posterity.

Actually, the sleeper idea didn't pan out as well as expected, and the Gooney quickly evolved into a conventional passenger craft with seven rows of twin seats along one side and seven singles along the other. But absence of the bridal suite did not irrevocably sever all association with romantic implications. The new dependability, introduced to commercial air travel as the Gooney rapidly captured over 90 percent of the business, was largely responsible for the appearance of hostesses on the airliners. The young ladies were a tremendous psychological factor in promoting confidence. The girls also quickly recognized that here was a career opportunity that was practically an "open sesame" to successful marriage.

It was during the war, of course, that the Gooney Bird reached the pinnacle of its glory. In the years from Pearl Harbor to VJ-Day thousands of airmen came to know it intimately and to swear by it.

Douglas began building Gooneys for the War Department some time before Pearl Harbor, and the military designation, C-47, evolved as the top brass figuratively ripped the seats from the DC-3 to adapt it to military use. The first of this series of modified versons was known as the C-39. But the various branches of service imposed a wide variety of special "wants." Some generals visualized elaborately equipped airborne command posts; the artillery people wanted a bigger door to admit large field pieces. The airborne stipulated a special type of flooring so that paratroopers' boots wouldn't slip; the Quartermaster talked about hoists, slings, and loading equipment. The medics had their own ideas about carrying litters.

As each innovation in turn was tried for size on the basic airplane, Douglas used model designations as high as C-53. Some of the ideas worked while others flopped. The C-47 emerged as the most versatile all around vehicle for military requirements, although a modest num-

ber of C-49 and C-53 versions were produced as well.

As the United States embarked on the grim business of winning the worldwide war, Gooney Bird crews found themselves engaged in every conceivable type of transport mission, including a good many that had never before been visualized.

When General Montgomery of the British 8th Army held a tiger by the tail as he faced Rommel's Panzer divisions in North Africa, C-47s flew in the vital parts needed to repair his battered tanks. When Guadalcanal seemed lost for the want of gasoline, the Gooney Birds delivered it in time. In every theater of operation, commanders looked to the C-47 for airdrop of paratroops, transport of supplies and ammunition, evacuation of wounded, and airlift of refugees.

When Gen. Jimmy Doolittle landed in China after the historic bombing of Tokyo from the carrier, *Hornet*, he made his way to safety in India aboard a C-47 flying refugees. This particular flight carried 68 passengers and a crew of 4, a total of 72 persons on an aircraft designed to accommodate about 20. This is not a record, however.

D-Day in Europe, June 6, 1944, saw the greatest assemblage of Gooney Birds ever organized. Some 1,200 aircraft in a column 200 miles long delivered paratroopers and glider troops to Normandy. A few weeks later when General Patton's armored columns launched a lightning attack across France and left their supply lines behind, the Gooney Birds averted certain disaster by getting the gasoline to the tanks on the front.

Stories of the Gooney Bird's exploits in World War II are legion. When the holocaust finally ended the first Americans to set foot in Japan were an AACS crew who landed their C-47 at Tokyo airfield to set up an air traffic control center.

When the production of Gooney Birds was halted after the war, bigger, faster, more powerful transport aircraft began to ease the venerable machine from its prominent position in the military inventory. But its usefulness persisted, and the record cites numerous postwar missions in which nothing else could do the job as well. It was the first aircraft to land at the North and South Poles. At the beginning of the Berlin Airlift better than 85 percent of the aircraft involved were Gooneys; and here, in fact, they saved the day by keeping the lifeline open until the bigger C-54s moved in.

In Korea, a few years later, C-47s of the 21st Troop Carrier Squadron evacuated thousands of wounded Marines from the battle area. It was assisted on these missions by a handful of other Gooney Birds and crews from the Greek and Thailand Air Forces. Some of these aircraft had received no maintenance since the war, and only the evidence of their eyes convinced the Americans that they could still fly. The aircraft were still powered by the original engines and there were no records to indicate how many hours had elapsed. There were wasps' nests within the cowling and cotter pins and safety wire had been replaced by baling wire. Most instruments were inoperative or missing. But somehow they flew, and turned in a creditable performance.

The Air Force put hundreds of Gooney Birds on the block at the end of World War II, but takers were few and the offerings were small—at first. It is said that some Gooneys in good shape were sold for as little as $1,200. The wise boys in the aviation business, knowing all the signs and reading the trends, were of the opinion that this beat-up airplane was finished. The size of their mistake is one of the wonders of the century.

Demobilized airmen, looking about for fields to conquer in civilian life, quickly latched on their old friend the Gooney as a magic touchstone of opportunity. Soon non-scheduled air carriers and freight lines sprang up all over the country. Before long the Gooney was employed in a variety of civilian occupations almost as varied as its wartime missions. It did anything from spreading fertilizer and insecticide in the United States to ferrying sheep from the Outback to the coast in Australia, and moving emigrants from place to place all over the world.

The Gooney Bird is still the most active item in the used aircraft market, but they are naturally less plentiful nowadays. A good used Gooney will command a price considerably higher than what they cost when first introduced 25 years ago.

There are still some bargains to be had, though, if the buyer can unravel the few strings attached. There is one perched high on the side of Mount Fujiyama in Japan; the trick is to get it down. There is said to be another in brand-new condition parked at the edge of a lake in Alaska. Trouble is, there's no road in to the lake and not enough room to get the airplane off the ground.

It is highly unlikely that a Gooney Bird will ever take a man to the moon, but no more reliable vehicle could be found to fly him out to the launch pad.

so you want a **COMMISSION** *and an* **EDUCATION**

If you can qualify, this new Air Force program is the way to get both.

by A1C Luther A. Dalton

AN OLD military adage holds that when his men quit griping, it is time for the commander to worry. Recently, however, a group of five airmen became the exception that proves the rule when they gave their unqualified approval of the way the Air Force is being run.

Voluntarily they admitted they like their assignments, had no complaints, and planned on a full Air Force career despite the fact they are frozen in their grades. Although plenty of airmen undoubtedly feel the same way, most would quaff the cup of hemlock before they would admit it. So why are these five uninhibited airmen different?

Probably because they are enrolled in the long-awaited and eagerly sought Airman Education and Commissioning Program (AECP). It is unlikely that anyone participating in this program will ever have much to gripe about, but commanders need not worry, because these men have proven they have the background and aptitude to attain a college degree and a commission in the USAF.

The program has two phases: (1) The academic phase providing undergraduate training leading to a degree in a field of study in consonance with Air Force requirements and (2) The military phase consisting of attendance at Officers Training School and subsequent commissioning. Phase two is naturally contingent upon successful completion of phase one.

At the present time, 59 airmen are in the academic phase of AECP, the first group to enter the program which was implemented in Fiscal Year 1960. Last June they began training at six universities.

This year (FY '61), 200 airmen will be selected for entry into the program. You could be one of them. If you are, you will be reassigned to the Air University Institute of Technology—which has the responsibility for the program—with duty station at a civilian educational institution.

The fields of study open this year include engineering, geodesy, international relations, meteorology, transportation, business administration, sanitary and industrial hygiene, and medical technology. This wide selection should open the door to most airmen who have the qualifications, eased, incidentally, since last year.

You must have 30 semester hours or 45 quarter hours of college work as an academic prerequisite, be a U. S. citizen at least 18 years old, and be able to complete both the academic and military phases of AECP before your thirtieth birthday. Of course all applicants must have those moral and personal qualities necessary for acceptance as an officer, and meet the medical standards as outlined in AFM 160-1. There are other requirements, as well as a listing of certain categories of airmen who are ineligible, in the governing regulation AFR 53-20. Base education officers or the Commandant IT can provide full details of the program.

It is easy enough to summarize AECP—two years at a university (the time may be extended under certain circumstances), three months at Officers Training School, and then the award of your commission. Traversing this road is not easy. It is an admittedly formidable undertaking, as those now in the program readily admit.

For Air Force college men, homework is a family undertaking. Wives earn special honorary degree of PhT, created by IT to recognize importance of helpmate's role in Putting Hubby Through.

It's also a distinctly different life. Going to college as an airman takes a readjustment in living habits, but according to five who spoke so enthusiastically about the Air Force and the program, it is challenging and rewarding. Always foremost in mind is the final goal—providing a compelling incentive which helps to pull you through the rough spots.

At Penn State

Studying for degrees in Meteorology at Pennsylvania State University, the five airmen are typical of those who first entered the program. One is a bachelor, and of the four married, all have children except one.

A1C John Rooney is 23 and single. He joined the Air Force in March 1959, and thinks the program offers more for the single airman than he could get anywhere else—either civilian or military life.

A1C Charles Power, 25, and his wife Darlene, from Oklahoma City, have no children. Darlene holds a job as secretary in the computation center at the university. Charles has five years' service. He is "going for 20."

A1C George T. Matteson, 27, and his wife Donna have two children. Charles has seven years' service, and after commissioning, will have over nine.

SSgt. Bobby J. Higgins and his wife Evelyn have four children and live in a trailer. Bobby has eight years' service and laughingly says he's "competing with Ron for the title of the oldest second lieutenant in the Air Force."

"Ron" is Sergeant Nelson—the "old man" of the outfit at 28. He has 10 years in the Air Force and says he will beat the age limit of AECP "by the skin of my teeth." His wife Etta gave birth to twins August 9 increasing the number of Nelson children to four.

Like thousands of airmen before them, these five had always wanted to complete a college education. They were torn, however, between this and remaining in the Air Force. Until AECP allowed them to do both, it was a constant struggle to arrive at the right decision.

Prior to AECP, airmen hungry for an education but still devoted to Air Force careers found that Operation Bootstrap was the best means of getting a degree and not losing longevity or their Air Force grades. But Bootstrap does not offer a commission and it is a long, drawn-out process, requiring a great deal of study on a student's own time. Until he accrues enough credits for full-time attendance in the last semester of college, the pursuit of his education is a constant drain on energy and time.

AECP eliminates this problem because students attend school full time, and all other military duties are cancelled until he graduates.

Unanimously, the airmen at Penn State think the academic schedules are realistic, and most assuredly eliminate the problem of time for study. During the summer they attend classes from 8 a.m. to 12:30 p.m. Other semesters the schedule runs from 8 to 11 a.m.

Airman Rooney commented that this sounds like AECP is a soft touch. "Especially," he observed wryly, "when you consider that your whole duty is going to school, you pay no tuition, and receive regular allowances for food and lodging in addition to your regular pay. You rightly conclude you are literally being paid nearly $300 a month to go to school about four hours a day.

"But let me set you straight," John added. "For every hour I spend in class I spend two hours studying at home." By simple arithmetic this brings his invested time in pursuit of his degree to about 12 hours a day. "The fellow who thinks he'll come here and have a snap is dreaming. It takes plenty of studying and if you miss a class or two you're dead."

The airmen wear civilian clothing at school and, as Rooney points out, "Most of our professors don't even know we're in the Air Force. We are treated just like any other students, which suits us fine."

Occasionally time still plagues the married students, particularly those with children. Recognizing this, the Institute of Technology at Wright-Patterson AFB has created a special honorary degree for wives. It is called the PhT, which translated means, *Putting Hubby Through*. The wives earn it, too, seeing that family life continues as normally as possible while hubby concentrates on his studies. It gets tougher if a wife must take a job to make ends meet. This usually means Dad often keeps one eye on his homework and the other on Junior while Mom is working.

Such cases are rare, though, because the Air Force realizes this situation is not conducive to effective study and, whenever possible, selects universities where reasonably priced housing is available. Further, the student gets $2.57 a day for subsistence and from $51.30 to $96.90 monthly for housing depending on whether he is married and has children.

"We're getting along all right financially," said Donna Matteson. "The only thing I could complain about at all is that we don't have a commissary close by. Because of this it costs us about $30 more a month for food. If the children get sick we don't have a dispensary, and although medicare takes care of the big things, little everyday things like colds, shots, and prescriptions can get expensive. Taking the good with the bad though, we're doing all right."

Help When Needed

Problems for students do crop up, however, and when they do, there is a liaison officer to help. Usually this is the ranking officer available who may himself be attending college under other IT programs. At Penn State he is Maj. Bernard Zavos who is working for his doctorate in meteorology. Besides the five airmen in AECP, Major Zavos has 49 other Air Force students to whom he gives advice and help.

Students and their wives also help each other. Wives at Penn State meet each month, discuss problems and exchange information. They assist new students in getting situated, and even go so far as to place a notice in each motel and hotel in the area advising incoming families where they can get in touch with a member of the wives' club for a briefing.

In the main, new arrivals are favorably impressed with their unusual duty station. State College is a typical university community; excellent swimming, a golf course, several movies and the like. There is canoeing, archery, minature golf. For weekend visits home, Black Moshannon Airport is only 22 miles away.

Assignment to the academic phase of the program means no promotion for awhile—all students are frozen in the grade held upon entering the phase. When you begin OTS however, you draw the pay of a staff sergeant unless you were of a higher grade when you began the program in which case you continue to draw the higher pay and allowances.

When you get your degree, you and the family move to OTS at Lackland AFB, Tex., on PCS, with all allowances authorized including the dislocation payment. After OTS and your commission, families are again given all PCS benefits, and the Air Force waives the 12-month base-residence requirement for payment of dislocation allowance.

As the program improves and progresses, most students entering will have a little over two years' service. After commissioning, all are required to complete at least four years of active duty. This is where the Air Force gets its return on the investment. It is likely that most men completing this program will continue to a full and rewarding career in the USAF, bringing to it their greater knowledge of those specialties and fields most critically needed.

For this reason airmen are selected on a competitive basis, and the mere fact that you have the prerequisite qualifications is no assurance that you will be one of those chosen. All applicants are carefully screened and selection is made by IT.

On the other hand, present lack of academic qualifications should not prove discouraging. There will be other years and other quotas, and academic requirements can be met in the meantime by attending any of the several educational programs open to airmen. By acquiring excellent grades and the necessary credit hours, you can apply at a later date.

Once an airman is selected for training he is required to accept a discharge and reenlist for six years. This covers the normal tenure in the program, plus the four years' service as a commissioned officer. Those who fail to make the grade in either the academic or military phase, will be returned to normal duty to serve the remainder of the six-year enlistment. This is no deterrent to application, however, because the prime requisite for the selection is that you must be career-minded from the start.

For every student grinding away at his daily classes, the future is bright and unlimited. New and broader vistas lie before him and the heights to which he may aspire are restricted only by his imagination, efforts, and professional ability.

Statement for The Airman

It is my opinion that the Airman Education and Commissioning Program offers to ambitious, willing-to-work young men a wonderful opportunity to serve their country and immeasurably improve their intellectual status. The selections are made on a competitive basis; therefore the program is also a measure of the desire and effort an individual is willing to put forth to meet this competition. The mere meeting of minimum requirements should not be the goal of ambitious airmen. Meeting the minimum academic requirements will determine eligibility but will not necessarily determine selection. A scholarship with the same opportunities would be highly competitive in civilian life.

I recommend to each airman a careful study of the overall quotas and the requirements for each course. The quotas reflect the present requirements for trained personnel in the Air Force, and the fields with the largest quotas represent the greatest opportunities for selection. As it will be noted the largest quotas are in the engineering and science fields. Airmen with interest and ability in these fields should give careful consideration to such study before becoming involved in highly competitive fields where the needs of the Air Force are limited.

GLENN O. EMICK
Director, Admissions Division
Institute of Technology

USAF's 35th Medal of Honor was reserved for a cool Norwegian youngster from Wisconsin, Maj. Richard Ira Bong, who scored a total of 40 victories and became WW II's

Ace of

by SMSgt. Hal Bamford

EARLY in April 1944, Maj. Richard Ira Bong was ordered to the Air Force Aerial and Ground Gunnery School, Matagorda, Tex.

Such an assignment, under ordinary circumstances, would hardly have drawn notice. But Major Bong was not an ordinary fighter pilot. Rather, he was returning to the United States from an extensive tour in the Pacific Theater as America's leading aerial ace, the proud possessor of 28 confirmed victories over the Japanese.

It was on April 12, 1944, near Hollandia that Bong had topped the quarter-century-old record of Capt. Eddie Rickenbacker by scoring two confirmed victories, plus a probable which was later confirmed, moving him into the all-time lead as America's most successful fighter pilot.

At this point, Gen. George C. Kenney decided Bong should return to the States because "I didn't want that pitcher to go to the well too often."

The theory was excellent, but the end result was not that expected. Five months later, Major Bong, showing again the determination which made him the successful pilot he was, was back in the Pacific and virtually demanding a return to combat duty.

Instead he was assigned as a roving gunnery instructor for the younger pilots, many of whom had not had a complete gunnery course before being ordered into combat.

Despite the fact that he was eager to return to the aerial battle himself, Major Bong accepted his new role—with reservations. Stressing the fact that he would have to have some method of checking the success of his instructional methods, he managed to persuade General Kenney that he should be allowed to accompany his pupils, "from time to time," on their combat missions.

General Kenney reluctantly agreed, with reservations of his own. He specified that Bong was to engage in combat only in "self-defense."

In the 35 days that followed this hesitant green light, the young Wisconsin native repeatedly "went to the well," and continued to raise havoc with the enemy.

During this period, Bong engaged in combat, often in almost complete disregard of orders which had virtually grounded him, and to the general concern of headquarters and his flying companions.

On October 10, shortly after his return to the theater, the young major, still only a few days past his 24th birthday, scored wins 29 and 30 over Balikpapan. The effectiveness of his instruction was probably also instrumental in the fact that American fighters scored a total of 61 wins over the 90 fighters the Japanese chose to risk against them.

When word of Bong's new victories arrived in Washington, official concern reached new heights and General Kenney was again reminded that his ace was to stay clear of situations which could lead to combat.

Despite this newly stressed unofficial order, a scant two weeks later Major Bong was among the four fighter pilots who bounced off the Tacloban strip at Leyte to intercept a five-plane early morning raid. Once again he scored a kill, running his total to 31.

The very next morning, Bong was assigned to scout the local area from the air for suitable sites for additional strips. He had hardly cleared the ground when a local radar operator warned him of a brace of Japanese fighters lurking nearby.

Bong was informed of their position, vectored toward the two intruders and, in full view of the troops on the ground, scored wins 32 and 33.

Realizing that headquarters was going to hit the proverbial ceiling over these latest exploits, General Kenney fired off a wire to Gen. Henry H. Arnold. "In accordance with my instructions Maj. Richard Bong is trying to be careful, but the Nips won't do their part. On the 27th, five hours after arriving at Tacloban, Bong was again forced to defend himself and number 31 resulted. On the 28th, while looking for suitable localities for airdromes in the vicinity of Tacloban, he was assaulted by two more Nips who became numbers 32 and 33. Unless he was bothered again today this is his latest official score."

A couple of days later, General Arnold's reply was delivered to Kenney. "Major Bong's excuses in matter of shooting down three more Nips noted with happy skepticism by this headquarters. Subject officer judged incorrigible. In Judge Advocate's opinion, he is liable under Articles of War 122 (willful or negligent damage to enemy equipment or personnel)."*

*From *General Kenney Reports.*

In the Name of Congress

No. 26 IN A SERIES

# of Aces

By early November, American forces were exerting tremendous pressure on the enemy ground forces in the Philippines and every effort was being made by the Japanese to get reinforcements into their beleaguered ground troops. On November 9, the enemy sent a convoy into Ormoc Bay. The following morning, American air forces chose this concentration as their target.

A combined force of B-25s and P-38s smashed the relief party, virtually wiping it out. In the battle, Major Bong, along as an observer, was again forced to "defend" himself and racked up victory number 34. Less than a week later, he scored two more wins to run his total to 36.

After this latest escapade, working solely by wire, and with the full approval of General MacArthur, General Kenney drew up a recommendation for the Medal of Honor. The citation was simple, among the shortest ever filed for this nation's highest award. On December 8, 1944, word arrived from Washington that the decoration had been approved, marking the 35th Medal of Honor bestowed upon a member of the Air Force.

It read: *For conspicuous gallantry and intrepidity in action above and beyond the call of duty in the Southwest Pacific Area from 10 October to 15 November 1944. Though assigned to duty as gunnery instructor and neither required nor expected to perform combat duty, Major Bong voluntarily and at his own urgent request engaged in repeated combat missions, including unusually hazardous sorties over Balikpapan, Borneo, and in the Leyte area of the Philippines. His aggressiveness and daring resulted in his shooting down eight enemy airplanes during this period.*

On December 12, in a public ceremony at Tacloban, General MacArthur pinned the decoration on the chest of this young hero who has been described as "speechless with stage fright and shaking like a leaf."

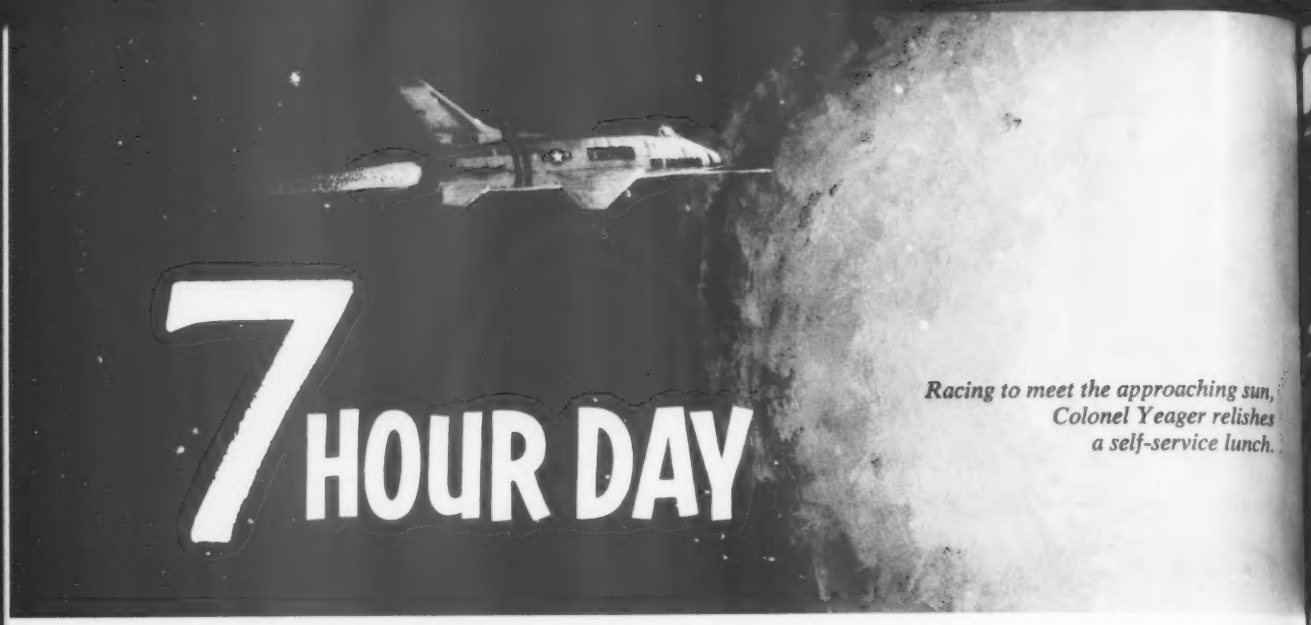
Between recommendation and award, Bong's total had jumped again—to 38—and, the very next morning, he scored victory 39. Four days later the total became 40.

Convinced that as long as he stayed in the theater they could not keep him from combat, Bong was again ordered home and departed the day after Christmas. He arrived in the States early in the new year and was assigned to Wright-Patterson AFB, Ohio, where he served as a functional test pilot.

The following June, Major Bong was transferred to Burbank, Calif., and became Chief of Flight Operations at the Lockheed plant there. At that time Lockheed was engaged in the development of the F-80, and the major underwent an intensive training course in the new jet.

On the morning of August 6, 1945, an American bomber dropped the world's first atomic bomb on Hiroshima. Only a few hours after this stunning event had become known, fighter pilots throughout the Pacific and Air Force men around the world were shocked by the news that Maj. Richard Ira Bong had been killed in a crash near Burbank when his F-80 experienced a complete power failure.

America's Ace of Aces, who had survived more than 200 combat missions totaling well over 500 hours, had given his life in a typically selfless fashion—testing a weapon that promised new strength for the men who would follow his image in future aerial battles.



7 HOUR DAY

Racing to meet the approaching sun, Colonel Yeager relishes a self-service lunch.

by Lt. Col. "Chuck" Yeager

A BRILLIANT three-quarter moon hung over my left shoulder as Lt. Col. Jim Randall and I lifted from the runway at England Air Force Base. The afterburner of our F-100 shed a ruddy glow around the airplane so that we seemed to rush skyward through a halo of light. It was 0250 hours, local time.

The clouds, hanging 350 feet above the ground, were jet black as we passed through. Breaking out on top was like entering a new world, the utter darkness relieved by the reflection from a fluorescent, snowy carpet below.

The mission was a nonstop flight from England AFB, La., to Moron Air Base near Seville, Spain, as a part of Tactical Air Command's regular squadron rotational program. As commander of the 306th Squadron I led the Alpha flight of eight aircraft. Jim, as operational readiness inspector from TAC headquarters, rode along in the back seat of the F-100F to check my squadron's proficiency.

We had already completed the first part of the aerial trek to Italy a day earlier after saying goodbye to wives and kids at George AFB, Calif. This intercontinental leg of the rotation was to be the proof of the pudding. All our training would be put to test. We were scheduled to spend more than eight hours in the *SuperSabre,* refueling three times from aerial tankers—once by night—and our single-engine supersonic fighters would cross the expanse of the Atlantic Ocean.

Back at England AFB we had undergone 12 hours of crew conditioning to insure physical and mental readiness for the flight. Two steaks—well done—were the main items on the menu during the conditioning period. Now throughout the flight we would eat only bite-size sandwiches, chocolate bars, chewing gum, fruit juice, and water.

All 18 pilots were fit and rarin' to go when we assembled for the final briefing. The plan called for the eight aircraft of Alpha flight to take off in pairs at 15-second intervals. Bravo flight of six planes led by the squadron operations officer, Maj. John Wray, would follow 30 minutes later. Cocoa flight with four aircraft would stand by for 30 more minutes before taking off with Capt. Harry Schurr in the lead.

As we climbed out at 350 m.p.h. I heard Lt. Joe La Casse, my wingman, call out a reassuring "Gears up, flaps up." Moving up toward 29,000 feet the same phrase was repeated through the earphones in perfect rhythm as each pair of fighters shot through the clouds to join up in tactical formation.

Upon reaching cruising altitude, I set a course for Jackson, Miss. Except for a few brief exchanges with radio checkpoints along the way and the steady drone of the engine, the surrounding world was hushed and still. Crossing over Jackson I glanced at the faint glow filtering through the clouds from the sleeping city. I wondered how many of those good citizens below knew that we were high above them, out of sight and out of hearing, and experiencing one of the most thrilling adventures of a lifetime.

Jackson was behind me when John Wray called on the UHF radio confirming the safe takeoff of Bravo flight. We were 600 miles out from England when Cocoa passed the word that the remaining four fighters were on their way. Now I could relax.

It was while checking the instrument panel to assure myself that everything was functioning properly that an odd thought occurred.

"Isn't it a miracle that 18 supersonic aircraft with thousands of moving parts can perform so surely and steadily in response to the touch of a human hand?" I wondered if all 18 pilots were proficient enough to sustain control over the tremendous power surging from the tail pipes. I wondered if our training program was good enough.

EDITOR'S NOTE. *Colonel Yeager, first airman to break the sound barrier, was commander of the 306th Tactical Fighter Squadron, George AFB, Calif., when he led the squadron to Aviano Air Base, Italy, for a period of duty at the NATO base. The main leg of the overseas movement was a nonstop over-water flight from England AFB, La., to Moron AB in Spain. Colonel Yeager gave this account of the flight to SMSgt. Jim Roth of Headquarters, Twelfth Air Force.*

The status of training was still on my mind when the panel clock told me it was time to check in for our first rendezvous with the tankers. At exactly one hour and fifteen minutes from takeoff I switched to the tankers' radio frequency and hopefully spoke into the microphone.

"Shirk Alpha, this is Plink Alpha. Are you out there?"

Immediately from somewhere ahead in the night the voice of the KB-50J commander spoke loud and clear. "This is Shirk Alpha. How many chicks in your flock?" His strong, assured tone was like music.

"Eighteen F-100s," I replied. "We expect to be over Columbia at the briefed time."

These tanker chaps are really tops when the chips are down. Sometimes during practice hookups we have some reservations about them, and maybe they feel the same way about us. But during the real thing, every operation goes like clockwork.

I turned on the mike button for ten seconds so the tanker could take a fix on us. He established our position at 170 miles distant on a 90 degree course. Switching to our own channel, I told the flight to get on the tanker frequency. In turn, each one checked in.

It was still black outside, and the moon was sinking into the horizon behind us. I leaned forward, straining my eyes to look for the tankers.

At 35 miles from rendezvous we knew the approaching tankers were starting their turn to take up position ahead of us. We started the letdown from 29,000 feet.

Twenty miles ahead, we saw their flashing lights—five big, beautiful KB-50Js in perfect formation. This was the moment of truth—our first night refueling on a deployment.

A mile behind the tankers, I called to the flight, "This is it. Line up."

The fighters broke formation and came up in line, two F-100s behind each KB-50J. The tankers' gas lines began reeling out. We moved up to within five feet of the extended drogue—lined up the probes on our right wings—gunned it a little—and the fittings meshed. The reels took up the slack. Indicators showed 230 knots at 20,000 feet.

My ship was taking fuel nicely, but I wouldn't know about the others until the tanker commanders passed the word. In a matter of minutes 7,300 pounds of fuel poured into my aircraft and the tanker advised that the entire flight had successfully hooked-up and all were taking on JP-4.

"Some of the boys from our outfit will be waiting for you when you get over Lajes," said the tankerman as we unhooked. "Say 'howdy' for us when you meet 'em."

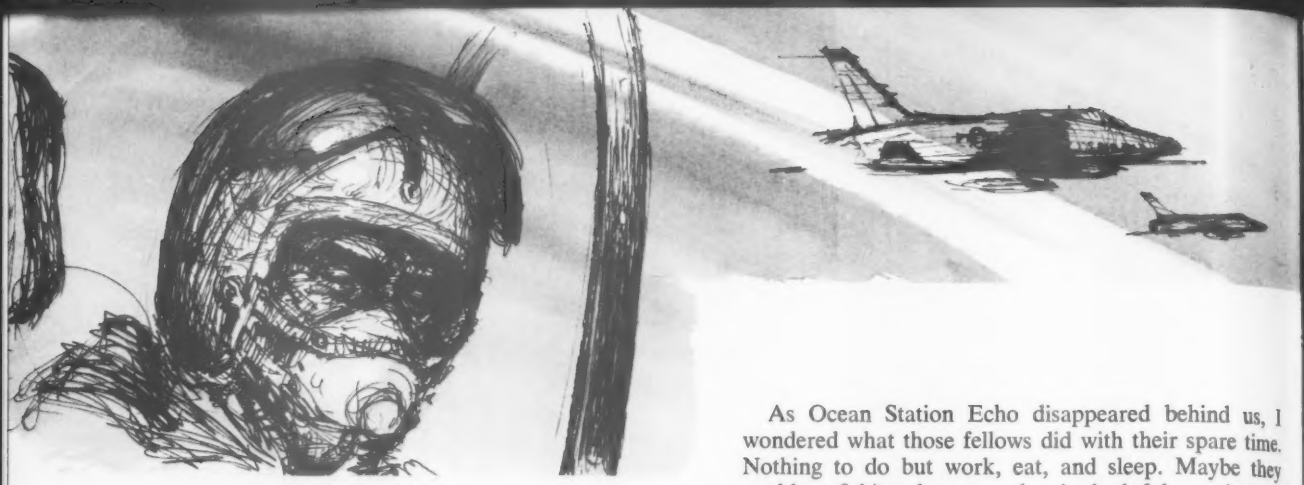
"Roger. And thanks for the gas." We dropped under the tanker, ran up the power and climbed back to 30,000 feet with a heading toward Myrtle Beach.

Dawn was beginning to break as we crossed the coast line and headed out over open water. Below us, the ocean was leaden-gray. It looked cold, ominous, menacing. Up ahead the sky was milky, with a delicate fringe of pink at the horizon. The brightest spot—where the sun would come rushing up from the ocean—was obscured for the moment by a jet-black thunderhead. The eastern star was right on our nose.

Then, as if out of nowhere, the sun leaped into view balanced on the line of the horizon, fiery red, brilliant, and dazzling. I pulled the visor down and looked again at the expanse of restless water.

Randy in the back seat was a quiet passenger, and neither of us spoke as we viewed the endless miles of ocean. Later I found we had shared the helpless feeling of loneliness that everyone knows when flying over water with only one engine standing between here and eternity. It is a time for humility and a time for prayer. It is a time to be thankful for good maintenance people, and crew chiefs, and the troops along the line who pack survival kits and rubber boats and Mae West jackets.

It is a time, too, for the imagination to play tricks. First the noises begin—sounds like no one ever heard before in the innards of an F-100. There's an eerie whistling, followed by an ominous rumbling. Gauges then jump about in erratic, hysterical malfunction and the engine seems to be running rough. It takes a little effort to dislodge this black dog from one's back, and



I deliberately turned attention again to the whitecaps dancing on the ocean below.

Restored to rationality, I noted that the sun was climbing high in the sky. Actually, Mr. Sun and I were racing to a rendezvous, the bird moving eastward at 600 m.p.h. while the sun streaked toward us at a thousand.

Suddenly Bermuda lay dead ahead, and no more lovely jewel ever graced a royal crown. Johnson Island looked like a toy airfield with the runways distorted out of proportion. It was just about breakfast coffee time down there when the voice of Capt. Rich Wescott, our Mobile Control Officer at Kindley, came over the radio.

"This is Plink Ground—the world's finest. How are things up there?" Rich must have already had his breakfast. Nobody could be so cheerful on an empty stomach.

Now a new team of tankers from Kindley approached for the second refueling. A daylight refueling is a piece of cake, and this one went by the book. It's practically a disgrace for a pilot to miss the drogue on the first try, and of course it could be dangerous. Only six or seven minutes are available before the point of no return is reached. If the probe is not already in the drogue when the critical fuel level is reached, the pilot must turn back. It would be embarrassing—to put it mildly—for a member of Alpha flight to be forced to land at Bermuda.

The Air-Sea Rescue boys—the fellows with the inelegant but appropriate call sign of "Duckbutt"—checked in to give us a new heading of 110 degrees, and the information that the next checkpoint was Ocean Station Echo 500 miles ahead over the Atlantic.

Station Echo proved to be a tiny ship rocking in remote isolation in the middle of the ocean. From our grandstand seat six miles up it appeared to be no more than 10 feet long, but it was possessed of a powerful radio voice and challenged us with forceful authority. "Unidentified aircraft west to east, what is your call sign?"

After we had assured them that we were supposed to be where we were, the floating radio radar station gave us a new heading to the next checkpoint.

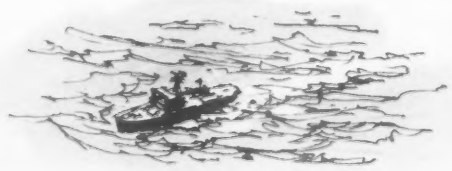
As Ocean Station Echo disappeared behind us, I wondered what those fellows did with their spare time. Nothing to do but work, eat, and sleep. Maybe they could go fishing, but even that is doubtful out there in mid-ocean. I thanked my stars for my own interesting job and looked ahead at a long stretch of nothing but sea and sky.

The next landmark was the Azores. First we saw the tall island with the volcano, then each of the remaining specks of land came into view. Again we rendezvoused with the tankers, this time taking on fuel directly over Lajes Air Base and providing, incidentally, a bit of diversion for the troops on the ground.

As we dropped away from the tankers, I began to think of the last leg of the flight. Soon we would be over the coast of Spain. Since this was the first visit for some of the pilots, and we would have to burn away some fuel anyway, I decided to give them the conducted aerial tour. We would drop down near the deck and look at some of the fishing boats, the olive orchards, and the beautiful beaches on the Mediterranean. In this, the rainy season, everything would be luscious green except the brown, swollen rivers.

Flying from the south of Spain to Seville, we would without question of a doubt meet the F-104s that Lt. Col. Johnnie Rosenbaum would send up to "intercept" us. Rosie, in command of a squadron at Moron Air Base, acts as official greeter for jet flights coming into Spain. Then when we landed, we could expect to find the crew chiefs awaiting us at the ramp with grins on their faces and perhaps a bit of refreshment conveniently near by.

From the back seat, Randy called on the intercom to break up my daydreams. He called attention to the moon that had just risen and shouted "Land Ho!" as the coast of Spain came into sight. Through the rearview mirror I watched a glow of red as the sun sank in the west. I glanced at the clock on the panel. Seven hours had passed since dawn. This was the shortest day of my life—a seven-hour day.



When you see that plump, golden gobbler gracing your table at Thanksgiving, remember—if you haven't heard before—that the turkey one time had very influential backing for being selected our country's national bird.

Had that happened the turkey, not the bald eagle, would be appearing on the great seal of the United States whose imprint authenticates top official documents, appears with some variation on military insignia, distinguishes with some modification the several Cabinet letterheads and is recognized generally around the globe as Uncle Sam's bird.

IT'S A GRAND OLD BIRD

To most Americans July 4, 1776, is memorable as the date the Continental Congress, meeting in Philadelphia's Independence Hall, adopted the enduring document we know as the Declaration of Independence.

A momentous decision, certainly, and a work of such magnitude as to warrant calling it a day, as our modern expression goes. But only a part of those historic proceedings was devoted to the Declaration.

The next-to-last item on the Founding Father's agenda for the day was a proposal which carried without opposition. It directed:

"That Dr. Franklin, Mr. J. Adams and Mr. Jefferson be a committee to bring in a device for a seal of the United States of America."

Although these three eminent patriots together represented a pool of unusually high talent for their day, designing an official seal was a task for which they lacked experience or familiarity. They summoned to their aid a Philadelphia artist, Pierre Eugene du Simitere, and planned that each member of this panel would make his own tentative sketch of what should be depicted on the country's shield.

In his try, Ben Franklin went back to the Old Testament for a scene he thought appropriate for the face of the seal. Thomas Jefferson likewise found his inspiration in an Old Testament theme. John Adams turned to mythology, with a presentation of Hercules choosing between figures representing Virture and Sloth.

As for du Simitere, he massed the heraldic shields of the many lands from which the country's settlers had come, then flanked this array with allegorical depictions of the Goddesses of Liberty and Justice.

The four designs were submitted August 20, 1776, to a Congress which manifested its lack of enthusiasm about the committee's offerings by quickly tabling the issue. A second try with a new committee in 1780 met the same fate as the efforts of almost four years earlier.

Despite the multiple postwar problems of getting an infant nation on its feet, the Continental Congress was still very much preoccupied about the design of a suitable and impressive great seal for governmental use. Accordingly, another committee submitted drawings on May 9, 1782. The Congress was still not satisfied, but the design evidently embodied some features believed to suggest possibilities. In this version a small bald eagle, with outstretched wings, appeared above the rest of the face, overtopping other heraldic devices that had been incorporated.

At this juncture, the whole six-year file was turned over to Charles Thomson, a remarkable individual oft referred to as "the perpetual secretary of the Continental Congress." He served in that capacity from its inception in 1774 until 1789 when it transmitted the last of its authority to the Constitutional Government of the United States.

Thomson redid the face of the seal to make the bald eagle with outspread wings its overwhelmingly dominant feature. He conferred with William Barton, Philadelphia artist who had been working with the third committee and also had a knowledge of heraldry. Some incidental changes were made to give the design more of a professional touch.

This latest try at a design for the great seal of the United States was formally submitted to the Continental Congress on June 20, 1782, and approved the same day.

It is interesting to note that its first use is intimately linked with the armed forces. On September 16, 1782, the seal was affixed to a document investing General George Washington with full powers to treat with the British on the subject of prisoner-of-war exchange, a matter still outstanding pending ratification of the Peace of Paris in 1784.

Franklin Reacts

Details of the approval great seal were slow in reaching Benjamin Franklin who was still in Europe where he had been for some years, serving the fledgling nation in the most exacting of diplomatic capacities. Although numerous countries had used the eagle as

a symbol of national sovereignty—some well before the dawn of the Christian era—Franklin was more than disappointed (to put it very mildly) that it had been chosen as the national bird of his beloved United States. And he expressed himself on the subject quite bluntly.

"The turkey," wrote Poor Richard, "is in comparison a much more respectable bird and withal a true original native of America. . . . He is (though a little vain and silly, it is true, but not the worse emblem for that) a bird of courage, and would not hesitate to attack a grenadier of the British Guards who should presume to invade his farmyard with a red coat on."

Experts on turkeys remind us that the bird Franklin was championing for that national emblem created a far more majestic impression than those raised commercially today. Even the limited number that had been domesticated in the former 13 colonies had not been so long removed from their natural state that they had lost the marked grace of bearing, great agility and vividness of coloring which characterized their wild progenitors.

For every kind word Franklin wrote about the turkey, he had scores of unkind ones for the eagle. If there is any personal story to account for his deep antipathy toward the bird, it has yet to come to light. When he voiced his opinions on the so-called lord of the skies, however, he could be most derogatory and harsh.

"I wish the bald eagle had not been chosen as the representative of our country," the great patriot wrote his daughter, Sally, from France under the date of January 26, 1784. "He is a bird of bad moral character. . . . He is generally poor, and often very lousy."

Possibly in a decade or two after Columbus reached the Western Hemisphere, subsequent expeditions' encounters with the wild American turkey may well have been in the Yucatan Peninsula where the bird flourished at the time. Originally it was believed the turkey belt extended mainly up the East Coast in some depth from the Mexican peninsula as far as the southern portions of the Canadian Province of Ontario. Many years later, pioneer parties pushing westward encountered wild turkey flocks as far from the Atlantic as the present states of Iowa and Oklahoma.

It is well known that the first explorers on return voyages brought with them only those exhibits believed to dramatize the best the special resources and riches they thought the New World held. The noble looking wild turkey evidently stood well up on the priority list. There is good evidence that the first contingent of these birds arrived in Spain not later than 1519 and they appeared in England by 1524, if not earlier. As in their native America, they proved no problem to domesticate and proceeded to increase and multiply in the Old World.

And now comes the incredible switch. When the systematic colonization of North America began in the next century, settlers from Europe picked the wild turkey to accompany them back! The bird not only provided good fare on the long voyage over, but survivors assured a good nucleus for a barnyard flock once the settlers got established ashore.

It is a matter of historical conjecture whether the first Pilgrims had the traditional gobbler to grace their board for the country's initial Thanksgiving Day, as school books long have pictured the occasion. At least one source, however, contends that there were "several" of the birds aboard the *Mayflower* in 1620 when she cleared England for her epic voyage. On the other hand, it is a matter of record that soon after landing the Pilgrims repeatedly expressed amazement at the unusual speed of foot which the native wild "Turkies" showed in scurrying to safety through the virgin New England woodlands.

Trails to Turkey

Ben Franklin's preferred choice for the national bird owes its name by odd chance to our good NATO ally, Turkey. As far back as the ancient Greeks there was a traffic to Europe from Africa in a tasty table fowl from the west coast of the once Dark Continent. Since many of the old caravan routes converged in Asiatic Turkey, that nation came to be identified as the source of supply. The name of the country which was the final supply source, Turkey, was given to the birds.

When the wild American turkey appeared on the Old World scene, it was adjudged a larger variety of the long-known African bird, and indeed today the two are still scientifically classified in Latin, *Meleagris,* as two different family members of the same species. Prior to this, Portugal had begun development of the Guinea coast of Africa which was a major source of the original well-established fowl.

The upshot was that the American bird became the turkey while its African relative emerged as the guinea fowl. The name switch seems to have taken place with a minimum of to-do or confusion.

While one can sympathize with Franklin over his failure to have the wild turkey adopted as the national bird and get it on the face of the great seal, the old gentleman was rather uncanny in championing a feathered creature which was to become the national reminder of a Providence without Whose benevolence material things do not last—for very long.

—WILLIAM A. KINNEY

Meet the USAF Missile Family

What is a missile?

In the aerospace arsenal of the U. S. Air Force, a missile is an unmanned weapon system. It may be of the strategic type, poised to carry a warhead into the heartland of an enemy. It may be tactical, to be employed against the forces of war in specific theaters of operation. It may be defensive, for use against an aggressor's air weapons.

Whatever its purpose, it complements its manned counterpart—strategic bombers, tactical fighter-bombers, the fighter-interceptors of air defense. Together, the manned and unmanned weapon systems comprise a balanced force which combines the advantages of each so that the USAF "shall be organized, trained and equipped primarily for prompt and sustained offensive and defensive air operations."

Because missiles are not seen regularly overhead as are the manned aircraft of the USAF, it is difficult for airmen to keep pace with missile development. In the following 14 pages, THE AIRMAN therefore presents a pictorial and textual resume of the growing USAF missile family. Learn to recognize the members and to understand their missions and functions.

Boeing Airplane Co. photo

ATLAS

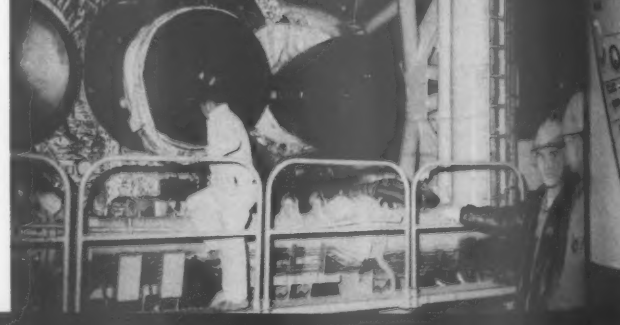
PRACTICE ALERT is part of the daily SAC missileman training.

This nation's first operational ICBM is the *Atlas*, poised and ready at Vandenberg and Francis E. Warren AFBs. Nine other sites and twelve additional squadrons have been programmed. The *Atlas* was first successfully tested on December 17, 1957, and in November 1958 flew its first full-range flight of more than 6,300 miles. In 1960 it was flown more than 9,000 miles and impacted in the target area. Its accuracy or CEP is proved to be less than two nautical miles.

As the *Atlas* was becoming operational, the missile was used successfully to orbit satellites around the earth for accumulation of scientific data. It has also been chosen as the launch vehicle to put man into space in *Project Mercury*.

The *Atlas* is a strategic missile with an in-silo launch capability. It is a liquid-fueled missile with two boosters developing 165,000 pounds of thrust in each. Designated the SM-65, the *Atlas* stands 82½ feet tall and at launch weighs 260,000 pounds. Its stainless-steel hull is 10 feet in diameter. It has a speed of approximately 18,000 miles an hour. All late models are guided by an all-inertial system but the earlier models

ATLAS *THRUST CHAMBERS on Warren launcher.*



used a radio-inertial command system.

When the missile is fired, all five rockets (i.e. the two booster engines, a sustainer engine and a pair of small vernier rockets) are ignited. A few moments after launch, and when the *Atlas* is in its proper trajectory, the booster engines are jettisoned and the sustainer engine accelerates it to its proper velocity of over 15,000 m.p.h. Then the sustainer engine is stopped. The vernier rockets are used to trim the missile to the exact velocity required for impact in the target area. The nose cone is then separated and follows a ballistic course.

The *Atlas,* in operational status with the Strategic Air Command, lends its missile capability to that of our manned bombers as a greater deterrent to war.

An ATLAS ICBM blasts from its launching pad.

RE-ENTRY VEHICLE check stands high on "pre-flight."

MINUTEMAN

The aptly named *Minuteman* (SM-80) is America's youngest, smallest, simplest, cheapest, least vulnerable, and most versatile intercontinental ballistic missile. This first three-stage, solid-propellant ICBM has an almost instantaneous reaction time and will deliver a nuclear warhead more than 6,300 miles at speeds greater than 15,000 miles per hour. Now in an advanced stage of development, the first *Minuteman* squadrons will become operational in 1962.

The *Minuteman* is often called a "second generation" or "second growth" missile because it was developed through the technological refinements of its heavyweight brothers, the *Atlas* and *Titan*. The solid-fuel rocket engines have no maze of valves and plumbing to malfunction; therefore require little maintenance. The design is simplicity itself—propellant grains bonded to the case burn from the inside out so that the case needs no heavy strengthening nor thick-walled insulation. There is no complicated countdown at launch time—target information is simply fed into the all-inertial guidance system and the fuel is ignited. The time from launch order to blast off is amazingly short.

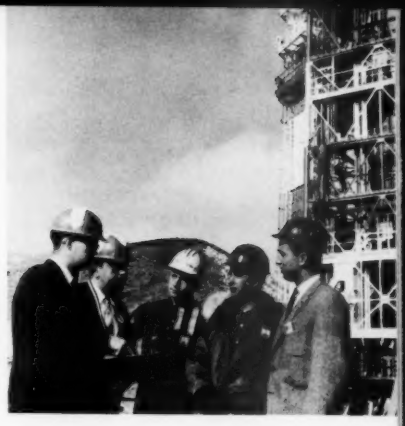
Assigned to Strategic Air Command, the *Minuteman* force will be composed of relatively large numbers of missiles strategically located in hardened underground silos in many widely dispersed areas. Almost as many more missiles will be mounted in conventional-looking railroad cars that will travel at random over our vast rail network. The missiles can be launched directly from trains as required. Moving almost constantly along the thousands of miles of railroad tracks that crisscross the United States, the mobile *Minuteman* squadrons will provide very poor targets for the enemy. Thus survival after a surprise attack is assured.

The small, light *Minuteman* is easy to transport by air, truck, or rail. The missile will be fully assembled and checked out by the contractors at centrally located production facilities where precision procedures can be followed. Rail-mounted missiles can be readied and checked out on a siding at the assembly point. Once lowered into a silo or mounted on a railroad launcher, they retain their operational readiness while stored for long periods of time with a minimum of maintenance. Thus the need for highly skilled technicians in the field is reduced. When maintenance is needed, the missile is returned to a central depot for overhaul and replaced by an operational missile.

Very little support equipment is needed at the launch site. After delivery and checkout the missile is tied in with its communications and monitoring equipment and is ready to go on a moment's notice. Once the lid is closed on the silo, human hands may never need to touch the missile again. Through an intricate, jam-proof, electronic sensitive command control system, the *Minuteman* can be fired with a great degree of operational flexibility—from selective launchings to total salvos. Site security is insured by roving patrols and an automatic electronic security system from the underground control center.

Boeing Airplane Company will integrate, assemble and test the *Minuteman*. Thiokol, Aerojet General and Hercules Powder Company will each provide one stage of the rocket engines. AVCO will build the nose cone and Autonetics Division of North American Aviation will build the guidance system. Systems engineering and technical direction of the development phase is being done by Space Technology Laboratories.

TITAN



Test-stand personnel discuss results of successful firing of Stage I of Titan *propulsion system.*

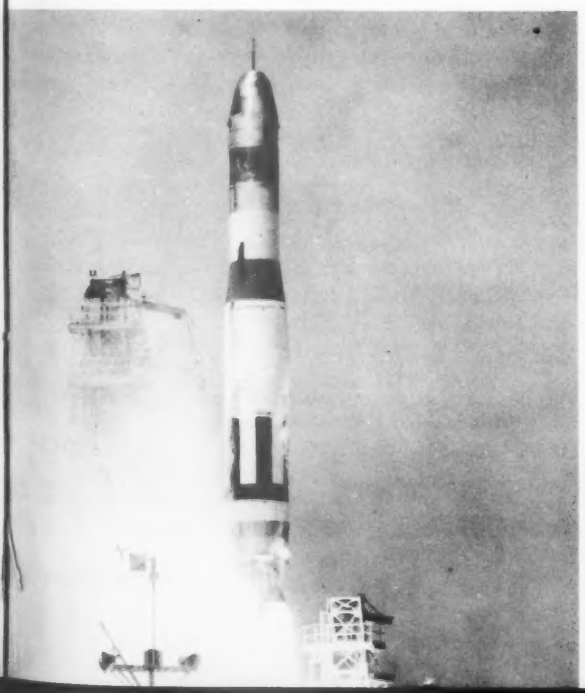
The two-stage, liquid-fueled *Titan* (SM-68) is the Free World's second surface-to-surface strategic missile with intercontinental range of more than 5,500 miles. It is now being tested and will soon follow the *Atlas* into operational readiness.

When the thermonuclear tests at Bikini Atoll proved conclusively that the H-bomb could be modified into a militarily feasible and efficient warhead, the *Atlas* had been given top development priority using the technical knowledge then available. But the state of the missile art was uncertain in 1954 and less than a year later the Air Force began development of the *Titan* which was intended primarily as a back-up for the *Atlas*.

The *Titan* program incorporated certain desirable design features that had been sacrificed in the *Atlas* because of these uncertainties. Profiting from knowledge gained in the *Atlas* development, *Titan* took a slightly different approach to the difficult technical problems and each associate contractor designed his particular assembly for possible use in the *Atlas*.

This dual development produced two-fold benefits: The *Titan* is a more sophisticated weapon system, and later *Atlas* missiles are using some of the advanced design features of the *Titan*.

Although the 98-foot *Titan* is more than 15 feet longer than its older brother *Atlas*, the aluminum-skinned *Titan* weighs about 40,000 pounds less at blast-off than the steel-hulled *Atlas*. The *Titan* has a substantial growth potential for increased range and heavier payloads. Its first stage propulsion system generates 300,000 pounds of thrust in a controlled two-minute explosion that is equal to four million horsepower, nearly twice that of the early *Atlas* ICBMs. This 53-feet-long first stage, which is 10 feet in diameter, drops off after burnout leaving the 80,000-pound-thrust second stage to sustain the nose cone on its way to the target at more than 15,000 miles per hour.



Like the *Atlas*, early *Titan* missiles have radio-inertial guidance systems. Later models of both will have all-inertial guidance.

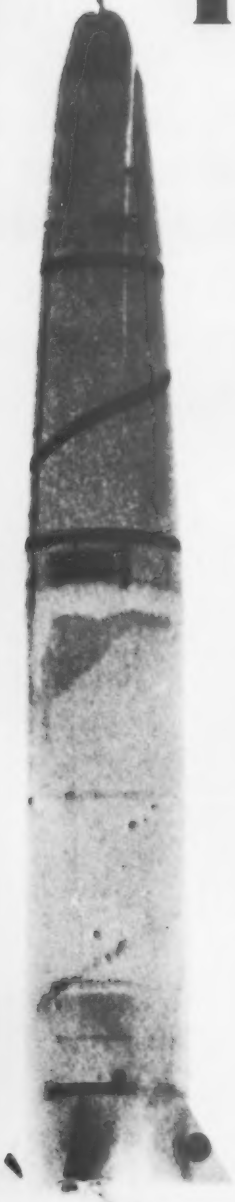
Fourteen *Titan* squadrons are planned and the sites will be manned by SAC crews at 10 bases.

Titan pioneered the hardened concept of launching missiles from underground silos where they are protected from enemy fire by concrete and earth. The hard-base subterranean *Titan* complex consists of three sunken cylinders. The main silo, 165 feet deep, houses the missile. One of the adjoining cylinders will house maintenance, electronic, hydraulic, and air-conditioning equipment. The other smaller cylinder will be a storage area for liquid oxygen and fuel. The control center, which is also underground, will be the only part of the complex occupied by missile personnel during launch.

When launch orders are given, concrete doors on the missile silo will slide back, and the *Titan* will be elevated to firing position above the earth's surface. Some distance away, a radar-tracking dome will be simultaneously elevated from its underground hiding spot. Countdown will take only minutes. All portions of the underground complex are connected by tunnels for operating efficiency. Later sites will be equipped with longer range *Titan II* missiles powered by storable propellants. These later versions of the *Titan* will be fired directly from their underground resting positions adding still more to their survival capability in event of an enemy attack.

The Martin Company is prime contractor for the *Titan*. The power plant is built by Aerojet General; guidance systems by Bell Telephone Laboratories and Remington Rand UNIVAC; the nose cone by AVCO and Space Technology Laboratory does the systems engineering.

THOR



A single-stage weapon, the *Thor* is the country's first IRBM. It is designated the SM-75, stands 65 feet high, has a diameter of eight feet, a launch weight of 110,000 pounds, and a range in excess of 1,500 miles. Since its range presupposes the use of overseas launch sites, the *Thor* was designed for convenient transport by such Air Force cargo planes as the C-124 and C-133. In operational installations it is moved on a special trailer (transporter-erector) which also serves as the missile-erecting arm at the launch pad.

The operational countdown time for the *Thor* is 15 minutes. In that relatively short time the missile is moved from its protective shed, erected on the launch pad, fueled and given all the necessary adjustments prior to blastoff. At the historic launch of the first *Thor* from Vandenberg AFB on December 16, 1958, the missile crew required 19 minutes for the countdown. Numerous subsequent launches attained the 15-minute goal.

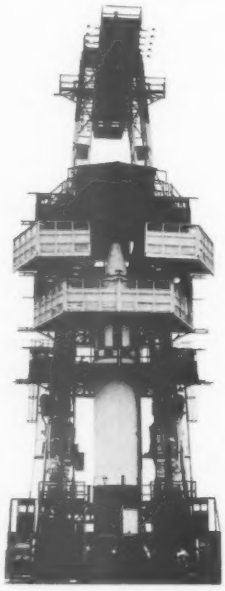
Deployment of *Thor* missiles to the United Kingdom began in 1958. There they are served by RAF operational crews, trained in the U. S.

In addition to its operational capability as a weapon system, the *Thor* has figured importantly in advancing the state of the art. It was the vehicle which demonstrated the successful reentry of payloads and dummy warheads despite the tremendous heat and shock these devices are subjected to when returning through the dense atmosphere. It also established the feasibility of recovering in-flight capsule data returned from orbiting payloads.

The *Thor* has been a workhorse in the civilian space investigation program, both in launches from Cape Canaveral and in the transpolar orbit *Discoverer* series from Vandenberg.

Douglas Aircraft Co., Inc., is the prime contractor.

Missilemen around the base of the gantry are dwarfed by the towering structure and the weapon it houses.



JUPITER

With the *Thor,* the Army-developed *Jupiter* has become a main strategic weapon of NATO and now stands in Italy and Turkey as a formidable deterrent to surprise attack. It is a strategic, intermediate-range ballistic missile, designated the SM-78.

Like the *Thor, Jupiter* has several firsts to its credit. It was the first Free World intermediate-range ballistic missile to be launched successfully. In May 1958 the *Jupiter* development team launched and recovered the first full-scale, heat-protected IRBM nose cone, demonstrating a practical solution for the aerodynamic reentry heating problem.

A *Jupiter* IRBM was launched December 13, 1958 with a nose cone containing special instrumentation and a live squirrel monkey in addition to a warhead. On January 22, 1959, the Army successfully launched the first Chrysler-made, operational type *Jupiter.*

The SM-78 was subsequently turned over to the Air Force for operational deployment.

SNARK

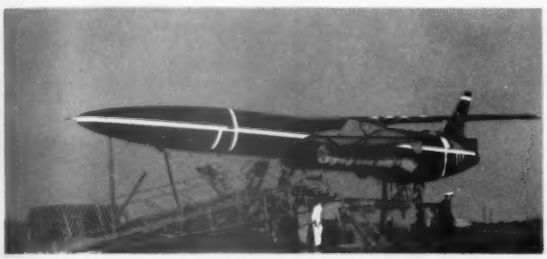
The *Snark*, SM-62, is America's only intercontinental missile that is not ballistic. Although its mission is identical to the ICBM, technically it is an ICGM—intercontinental guided missile.

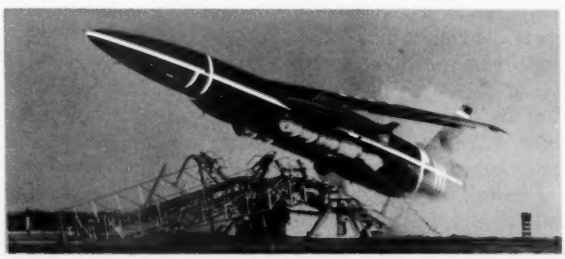
If anything could be called venerable in this youthful surging age of missiles and space, *Snark* would qualify. In December 1958, the first *Snark* missile squadron was activated at Patrick AFB, Fla., and the following year, this nation's first strategic, intercontinental missile squadron became operational at Presque Isle, Maine.

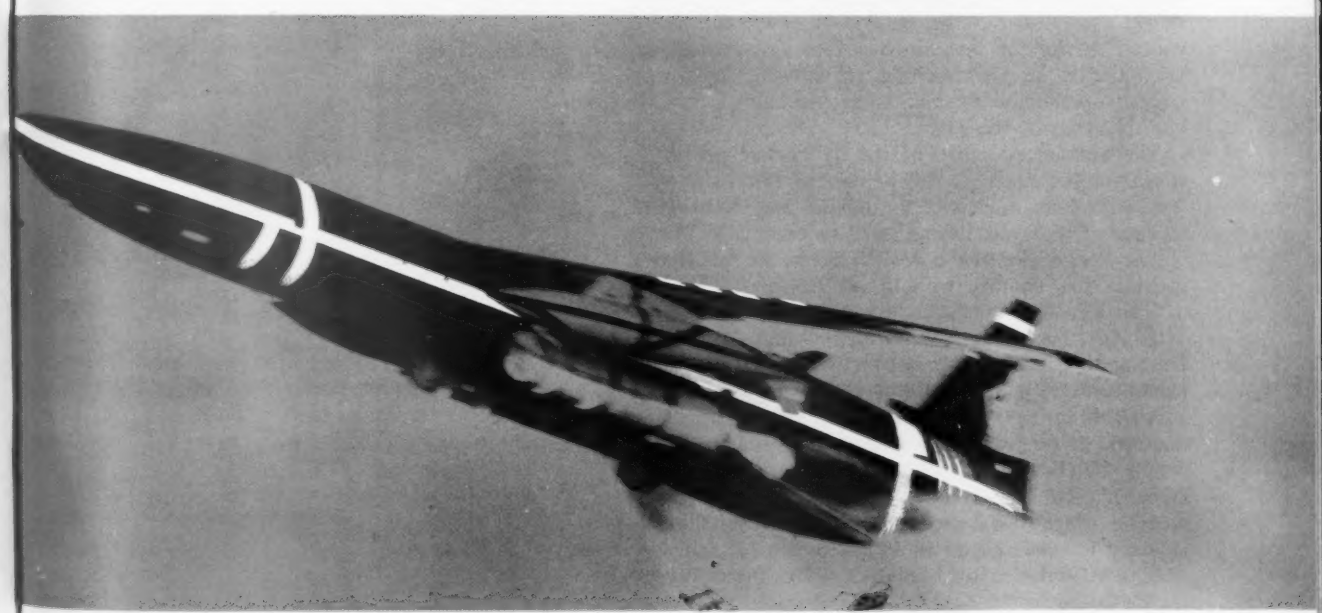
There is only one squadron of the SM-62 and there will be no more. The missile is an air-breathing, subsonic (Mach 0.94) vehicle, but it is capable of carrying a very large nuclear warhead. Its range is in the neighborhood of 5,500 nautical miles.

In the fall of 1957, the final station on the Atlantic missile range was completed and the entire 5,000-mile test lane over the ocean was opened. The *Snark* was the first missile to use the full length of the range. In this test, it was deliberately launched off-course to prove the ability of the guidance system to bring it into correct line for the target. It impacted on target, precisely as programmed.

Built by the Northrop Corp., the pilotless winged bomber is still a powerful weapon of the Free World's arsenal.







SKYBOLT

On October 13, 1959, a two-stage Air Launched Ballistic Missile (ALBM) arched from a specially adapted B-47 high over the Atlantic and roared toward a programmed near-miss of the *Explorer VI* paddle-wheel satellite which was heading toward its perigee arc of 156 miles above the earth's surface.

The shot was a pronounced success; the ALBM, after its flight into space, impacted in an ocean area about 1,000 miles distant from the coordinates of its aerial launch.

Leading to the development of the *Skybolt*, this and later tests of preliminary vehicles proved that the launch of a ballistic missile from aircraft traveling at either subsonic or supersonic speed is feasible. Although a follow-on to the *Hound Dog*, it is not an advanced version of this air-to-surface missile because the latter is an air-breathing vehicle—an unmanned aircraft—while the *Skybolt* is a true ballistic missile like the *Atlas* or the *Titan*.

The announced range of the hypersonic missile is roughly 1,000 miles. It can be carried externally by a B-52, and later models of the missile may be adapted to internal transport by the B-70 or other aircraft.

The significance of the ALBM lies in the fact that it provides this country with a ballistic missile capable of launch from the most mobile platform attainable to date. An airborne force so armed virtually would be immune to kill by an enemy's first strike, and therefore would insure a highly destructive retaliatory capability.

ALBMs further reduce the vulnerability of attacking bombers to enemy defenses because its release point would be beyond their defense capability. Once launched, the ALBM, like intercontinental and intermediate range surface-to-surface ballistic missiles, is virtually invulnerable to interception.

Skybolt is designated the GAM-87A. Primary contractor is the Douglas Aircraft Company.

Unof[illegible]'s conception of the Skybolt.

HOUND DOG

No decoy is the nuclear-armed, air-launched, Mach 2 GAM-77. The *Hound Dog's* bite is far worse than its bark and it can range several hundred miles in search of its quarry.

With two *Hound Dogs* nestled beneath its wings, a B-52G could wreak havoc on enemy air defense installations, and then proceed on its unmolested way to the primary target. Or it can stay outside the defense perimeter and send the "dogs" to blast the target area.

GAM-77 has its own inertial guidance system that allows it to be released high and dive low, leveling off before it gets to the target. It can also be released low, climb to a programmed altitude in one direction, reverse its field like an all-American half-back, and score from a different direction.

Essentially, the *Hound Dog* gives the Air Force a strategic missile with an extremely mobile launch complex. Besides the ability of the launch aircraft to take evasive action, the capability of the *Hound Dog* to alter its course and altitude provides formidable testimony of this nation's ability to get through to the target of any nation initiating aggressive action.

Prime contractor is North American Aviation, Inc. *Hound Dog* is 42.5 feet long and has a 12-foot wingspan. Personnel are trained at the Chanute Technical Training Center.

At the present time, there are 12 formal GAM-77 courses which include training for the Armament Systems Officer, Guidance Systems Mechanic/Technician, Control Systems Mechanic/Technician, Guidance System Analyst, Control System Analyst, Missile Systems Analyst Technician, Mechanical Accessories and Equipment Repairman, Missile Electrical Technician, Jet Engine Mechanic, and Missile Technician.

QUAIL

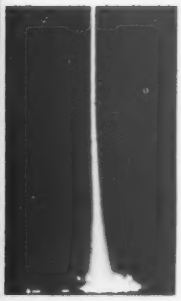
The quail is a tricky little bird given to appearing from nowhere to startle and confuse a hunter. These same characteristics describe the GAM-72, a *Quail* with the squawk of an eagle and a far more serious purpose in life than its namesake.

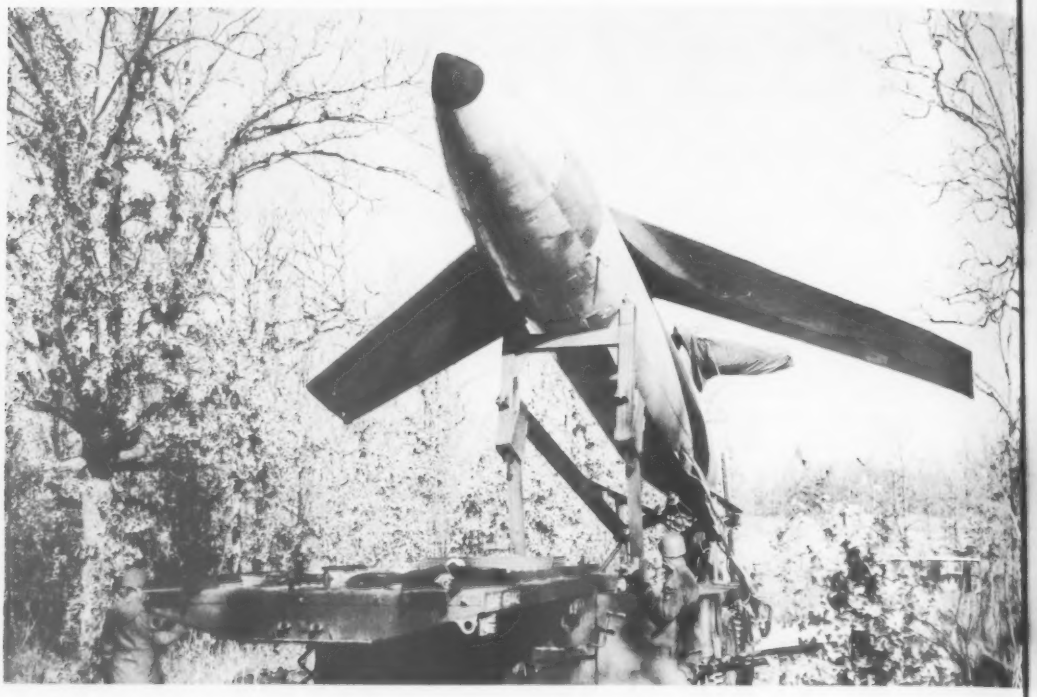
As an air-launched, diversionary decoy missile, the *Quail* drops suddenly from the bomb bays of its mothering B-52 and streaks off on a different course. Because of its peculiar configuration it paints a radar picture identical to that of the aircraft it just left. To enemy radar, the sudden appearance of two or more inbound attackers where seconds before there was only one, creates the kind of confusion that could confound his air defense.

The *Quail* matches the bomber's speed, operates to above 50,000 feet and can carry enough electronic jamming gear to clutter any scope. The idea, of course, is to get the enemy to expend effort and ammunition on the impotent *Quail* while the B-52 goes on to the target. The little *Quail* (only 13 feet long with a wingspan of 65 inches) carries no warhead. It is built by the McDonnell Aircraft Co.

Training is conducted today at Amarillo AFB, Tex. In six courses, five- and seven-level airmen from SAC are being trained on the maintenance procedures of the GAM-72. As they graduate from these courses, which cover AFSCs 31270, 31451, 31570, 43270, 43350, and 46250, they are assigned to operational *Quail* squadrons. The five- and seven-level trainees are men who have had experience on other weapons, but there are four other courses at Amarillo for airmen with no previous maintenance experience. These courses — far more comprehensive — also prepare trainees for assignment directly to operational units.

THE MATADOR





As the Strategic Air Command stands ready to deliver instant and overwhelming global retaliation against an aggressor, so tactical units are poised, equally alert to deliver firepower wherever required. Sharing equal billing with the flexible, deterrent might of its fighter-bombers are the tactical missiles now assigned to operational squadrons.

The United States Air Force has three tactical missiles—two operational and one in flight-testing.

The oldest of the tactical missiles still in operation, the TM-61 *Matador,* is a relatively short-range (less than 500 miles), radar-command vehicle that has a cruise speed of near 600 knots. The *Matador* is of the air-breathing surface-to-surface type with a ceiling of over 40,000 feet and capable of transporting either a conventional or nuclear warhead.

About the same size as a jet fighter, the *Matador* has a wingspan of 28.7 feet, a length of 39.6 feet, and a diameter of 9 feet. It can easily be transported and immediately launched from its special trailer platform. The *Matador* made its first flight in 1950 and has been in quantity production for a number of years. The *Matador* won the distinction of providing the Air Force with its first pilotless bomber squadron in October 1951. *Matador* units were deployed overseas in early 1954, but units in Germany, Taiwan, and Korea are being equipped with the *Mace*.

There are two *Mace* missiles, the TM-76A and the TM-76B. The A model is operational but the B is still in the testing stage.

The TM-76A is an improved version of the original *Matador* but with innovations which may warrant its classification as an entirely new missile. Although the speed is about the same as that of the *Matador,* the operational range of the *Mace* has been increased to over 600 miles.

An all-weather weapon, the *Mace* can be launched from unprepared sites such as an open field, or from fixed bases protected against sneak attack. Although about the same as the *Matador* in size and shape, the *Mace,* with its increased range, better guidance, greater flexibility, and decreased ground-support requirements make it a more effective tactical weapon.

Fewer than 10 crewmen are required to handle and launch "several" *Mace* missiles. Because the missile utilizes a standard aircraft-type jet fuel, no special handling or storage problems are involved and the *Mace* can be kept ready for instant launching.

The *Mace* is powered by a single Allison J33-A-41 turbojet engine long-proven by use in manned fighter-

AND THE MACE

type aircraft. The engine is started with the missile poised in flight attitude on the launcher. A retainer bolt holds back the missile until its powerful rocket booster is ignited and hurtles the *Mace* from the launching vehicle into flight.

The booster rocket, rated at 100,000 pounds thrust, separates from the missile shortly after the launch, and the jet engine provides the cruise power for the remainder of the mission.

Mace missiles now being deployed to Europe have a self-contained ATRAN (map-matching) guidance system which compares the terrain over which the missile is flying with a synthetic film strip of the programmed route, produced from topographical maps. If the missile's flight path deviates from the film "map" the system adjusts to the required correction. ATRAN is free of ground control and requires only a few enroute check points to accomplish its self-guided mission—hence it is virtually impossible to "jam."

Each *Mace* consists of seven basic parts: nose, wing, center section, aft-tail, fin, stabilizer, and instrumentation packages. These parts are assembled by crews in the field. The parts are interchangeable, and crews are not required to make electronic repairs. Flashing lights on the *Mace* automatic checkout equipment tell the crew if the missile is ready for launching. If a malfunction is indicated in one of the packaged subsystems, the "black box" is lifted out, replaced, and shipped to a repair depot.

Maneuverability of the *Mace* was increased with the development of the Terracruiser, a special vehicle designed to transport the missile and its support equipment. The Terracruiser earns its name from a remarkable ability to negotiate difficult terrain. This is done by use of lightweight construction and specially designed low-pressure tires that can be inflated or deflated by the driver while the vehicle is in motion.

When operating from unprepared positions, the *Mace* uses a vehicle known as a "Translauncher" which is equipped with balloon-type tires and can be towed across rugged terrain by the Terracruiser. The Translauncher was developed by Goodyear Aircraft Corp., Akron, Ohio, and the Terracruiser is produced by the Four Wheel Drive Auto Company of Clintonville, Wis.

The TM-76B is the newest tactical missile to be included in the Air Force inventory. It is 44 feet in length, has a wingspan of 22.9 feet, and a range of more than 1,200 nautical miles. Employing a new all-inertial guidance system, the TM-76B can be expected to bring enhanced capability to tactical airpower.

BOMARC

Air Force instructor explains operation of liquid-fueled rocket motor on Bomarc *IM-99.*

Today, before enemy aircraft could even approach our shores, they would be engaged in battle by fighter-interceptor and air-defense missiles. Lying sleepily in horizontal readiness, the *Bomarc* IM-99 missiles (I for Interceptor), in less than a minute after receipt of the firing order, can suddenly awaken, rise to a vertical position and speed skyward in search of targets—all by remote control.

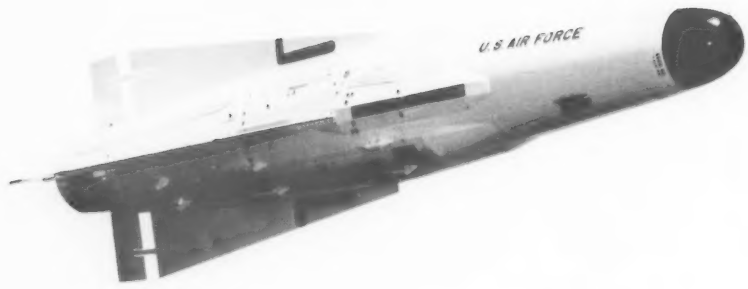
Technically, the *Bomarc* is described as a single-flight, long-range, surface-to-air, supersonic, interceptor missile. Initial boost for takeoff is supplied by a liquid rocket engine, and when the missile attains a predetermined speed, its two ramjet engines "cut in" and supply power for both the vertical climb to altitude and the cruise to the point of intercept. The *Bomarc* has been successfully fired on orders from a SAGE (Semi-Automatic Ground Environment) Control Center nearly 1,500 miles from the launching site. It intercepted subsonic and supersonic drone targets. When *Bomarc* reaches the target area its own electronic "brain" assumes control and "locks" the missile on its target.

Externally, the *Bomarc* resembles a conventional aircraft, since it has an airframe and control surfaces composed of a wing and tail group. Internally, the missile contains a rocket engine, a guidance system, a flight-control system, a warhead, and a nose-cooling and pressurization system. The ramjets are attached externally to the airframe. Supporting these main components are electrical, pneumatic, hydraulic, mechanical, and electronic systems.

All these systems and components make the *Bomarc*, like other missiles, an intricate and delicate piece of machinery. And since our *Bomarcs* must be in a state of constant readiness, many specialists and technicians are required to operate and maintain the missile and its ground support and test equipment. The Chanute Technical Training Center has the prime responsibility

for such training. To provide a trained cadre of USAF instructor personnel, the Boeing Airplane Company, which builds the missile, and the Marquardt Corporation, who manufactures the ramjet engines, were called upon. This training has been completed and these men are now engaged in conducting the first courses, which started in August 1960, and preparing training materials for courses to begin in the near future.

Bomarc's range of over 200 miles permits defense of large areas. It has a wingspan of 18 feet, a length of 47 feet, and a diameter of 35 inches. It weighs about 15,000 pounds, attains altitudes of over 60,000 feet at speeds higher than Mach 2.5. *Bomarc* employs the latest electronic guidance systems including a terminal guidance system in the missile itself. It can carry a nuclear or conventional warhead. The *Bomarc* is tied in with America's vast and complex air-defense systems which provide warning of an enemy air attack in seconds. Both single and multiple targets have been successfully intercepted by the *SAGE-BOMARC* system. Later models of the *Bomarc* will have increased range, and work is presently underway on a solid propellant propulsion system.



the GAR Family

GUIDED AIR ROCKETS (GAR), in use principally by the Air Defense Command, provide the supersonic interceptors with the punch necessary to repel aggression by manned bombers or air-breathing missiles. Some GAR missiles are equipped to deliver a nuclear warhead against airborne targets and others are fitted to the needs of a situation calling for conventional explosives.

Falcon, Genie, and *Sidewinder* are the names given to the three general groups of GAR missiles currently in the Air Defense inventory and under development. They can be carried either internally or under the wings of interceptor aircraft. These missiles use a solid propellant and, excluding the *Genie,* generally weigh a little over 100 pounds. The length of the various models ranges from 6.5 to over 7 feet, the body is approximately 6.5 inches in diameter, and the cruciform guidance wings vary from 20 to 25 inches in span.

Designations of *Falcons* are GAR 1, GAR 2, GAR 3, GAR 4, and GAR 11. The *Sidewinder* is designated GAR 8. GARs 1, 3, and 11, the odd-numbered vehicles, use a dependable radar homing guidance system. The even-numbered rockets, 2, 4, and 8, use a highly developed infrared homing guidance system and are commonly known as heat-seekers. During development tests, *Falcons* and *Sidewinders* repeatedly destroyed drone targets even without the presence of a warhead.

GARS under fuselage give air-defense interceptors a deadly punch.

GAR 8, although it is of the *Falcon* group, is known as the *Sidewinder* and has been in operational status for several years. GAR 8 is also widely used by U. S. allies, notably Nationalist China which demonstrated its effectiveness conclusively in the air defense area over Formosa. The *Sidewinder* derives its nomenclature from a snake of the same name which is guided to its prey by the heat exuded from the victim's body. In similar manner, the *Sidewinder* proceeds directly and unerringly to the heat radiated by the engine of the target aircraft or missile.

Another member of the air defense team is the *Genie,* a solid-propellant, air-to-air rocket considerably heavier than its *Falcon* cousins. The *Genie* is a supersonic, free-flight vehicle with a launch weight approaching 1,000 pounds.

This family of missiles, with its diverse capability and proven effectiveness in thousands of operational exercises, provides the principal

rmament employed by F-89, F-101, F-102, and F-106 interceptors.

Responsibility for individual training on the complete family of GAR missiles rests with the Technical Training School at Lowry AFB, Colo. As is the case with other types of missiles the GARs must be checked out to perfection using a semi-automatic checkout console with hundreds of circuits that accurately check to tolerance every missile function. The *Falcon* is moved from one end of the console to the other, with special circuitry checked at different stations along its path. A "suitcase" type checker is used for the GAR 8.

In addition to the many GAR courses offered at Lowry, the Field Training Team concept is employed, under which teams of skilled instructors are dispatched to Air Defense Command bases to provide up-to-date and follow-on training.

Lowry was the first Air Training Command base to conduct individual training on guided missiles, and has been in the business since 1951. The Department of Missile Training has produced more than 5,000 graduates in the missile career field. The majority of these graduates of the many missile courses fulfill the needs of the Tactical Air Command for operation of the TM-61 and TM-76 and the requirements of the Air Defense Command for employment of the GAR series.

The Man and the Falcon; *effective team guards aerial approaches to the North American continent.*

First blind flight was conducted in 1929 by Lt. Gen. Doolittle (Ret.)

EVOLUTION OF MISSILES

The development of military missiles, both ballistic and aerodynamic, is a natural extension of the evolution of airpower generally. The manned aircraft and the unmanned missile complement each other in providing the degree of flexibility necessary for optimum efficacy, and many of the accepted principles now employed in missilery were originally uncovered in association with aircraft development.

The problem of guidance in flight, for example, is as old as the airplane itself, and a crude automatic pilot was tested by American airmen prior to World War I. The first all-instrument flight in a completely covered cockpit took place in 1929, and from here it was logical to develop a workable system to enable an aircraft to fly a pre-set course automatically.

The need for a highly stable platform for the Norden bomb sight in the mid-1930s spurred development of more sophisticated automatic guidance, and the electronic autopilot provided the solution to this problem. Parallel development of radio-control techniques facilitated remote control of the autopilot.

Radio-controlled drone aircraft were in use in the 1940s, and the same techniques were applied to guided bombs during WW II.

In appearance, characteristics, and performance, modern missiles may differ radically from their ancestor, the airplane, but—unquestionably— the children have inherited many features from the parent.

In similar sequence, the performance and continued evolution of missiles can be expected to provide the magic "Open Sesame" that will open the door to space travel.

Are You a Safe Driver?

Every year several hundred airmen's lives are tragically lost in private motor vehicle accidents. Many of these mishaps are directly traceable to careless and poor driving. Safe driving, therefore, has become a vital concern to the Air Force.

By way of taking effective action against the causes of these motor vehicle accidents, the USAF has implemented a compulsory driver-education program. It also conducts an aggressive vehicle accident-prevention campaign the year round. At every Air Force base airmen are exposed to a good many reminders about driving safely. A billboard poster will warn: "Courtesy Saves Lives," "Your Life's at Stake with a Faulty Brake," or, "A Safety Check may Save Your Neck." Base newspapers, Commander's Call movies, and other media serve constantly to remind members of the Air Force to drive safely. But almost every accident indicates that someone didn't get the word.

The best drivers on the road today are the professionals—the men who handle huge trucks and cross-country buses. On all kinds of roads in every kind of weather, these men drive hundreds of thousands of miles without an accident. And yet, good as they are, their training never ends. Refresher courses and advanced instruction keep them constantly on their toes.

These experts know every driver must possess certain qualifications to be a *safe* driver. The professionals of the road meet each of these tests easily. Can you? If the following description of a safe driver doesn't fit you, you are in danger of losing your life.

Are you skillful?

The good driver moves smoothly and consistently, at a steady, reasonable pace. He doesn't weave from lane to lane. When preparing to stop or turn, he signals clearly.

Weather and traffic conditions are important factors in safe driving. In bad weather, more time and room must be allowed for stopping. At night, headlights should be adjusted to avoid blinding drivers in oncoming cars, as well as those directly in front. The safe driver doesn't "overdrive" his headlights. He drives at a speed that permits stopping within the range of the lights. In heavy traffic the skillful driver keeps pace with the pack, doesn't crowd other cars or force them to pass.

The good driver is always on the alert for the unexpected—the car failing to stop at an intersection, the youngster chasing a ball. He constantly tries to anticipate emergencies. Do you?

Are you well-informed?

The safe driver is familiar with traffic regulations, parking restrictions, and speed limits. He watches road signs carefully, particularly when driving in unfamiliar areas, or when crossing state lines where speed limits may change.

Recognition of his duties and responsibilities is another mark of the informed driver. Car inspection, licensing, financial responsibility, and, in many states, insurance requirements are covered by laws; full compliance with these should be a matter of course. Important, too, is knowing what to do in case of accident, and doing it promptly.

The well-informed driver is on familiar terms with his vehicle, knows what it will do and what it won't do. He services it regularly, repairs minor defects before they become major ones. He senses when mechanical trouble is coming. Can you?

The good driver has excellent physical coordination, a vital requirement for quick and correct reactions to driving situations.

All airmen who drive should see well, have good depth perception and night vision. If necessary, glasses should be worn.

Fatigue affects driving responses and judgment. The safe driver pulls off the road when he is drowsy. Do you?

Have you the right mental attitude?

The good driver is normally relaxed, not worried or absent-minded. He leaves his problems at home—doesn't get preoccupied, nervous or "freeze up" at the wheel.

Emotional stability is also important. The good driver won't fly off the handle when frustrated, or use his car to "let off steam."

Like all good drivers, airmen should always practice this golden rule: "Give the other driver a break, even though he's in the wrong." Remember that two wrongs never make a right. They're more likely to make an accident.

Apparently an earlier generation of airmen shared concern with the problem of safe driving.

This message appeared in *The Air Service News Letter,* November 9, 1920.

City of Everywhere
State of World
Nov. 9, 1920

Mr. Satan
999 Warm Ave., Hades

Sir: The bearer is the soul of Mr. Careless Mann, who met death while engaged in his regular occupation. While his death was sudden it had been predicted by many careful workers as he has always "taken a chance."

A number of such souls have been forwarded you in the past, and until such time that these careless men cease to exist you may expect others.

Yours for safety,
Hugh Manity

AIRMAN'S WORLD

FINAL TESTING has been completed on Convair's F-106B, two-place, all-weather jet interceptor which has been going through its paces at Edwards AFB, Calif., for several months. Identical with its "A brother" in missile armament and electronic gear, the B version differs only slightly in external appearance. Most obvious deviation is the slightly longer canopy which is necessary to compensate for the second tandem seat.

CONSERVATION AWARD

USAF conservation officials have issued an amendment to AFR 125-5A which establishes a General Thomas D. White Fish and Wildlife Conservation Award, so named in honor of the Chief of Staff. It becomes effective immediately.

Designed to stimulate improvement in the conservation program, the award will be made annually to the installation which has conducted the most outstanding program during the preceeding year. All installations sponsoring conservation programs of any size and scope, are eligible to compete.

The first award will be made for programs conducted during calendar year 1960. The cited amendment details procedures for making nominations for the award.

TRAINING TWIST

In the Washington, D. C. area, the local Civil Air Patrol unit maintains and operates a unique auxiliary amphibious fire fighter.

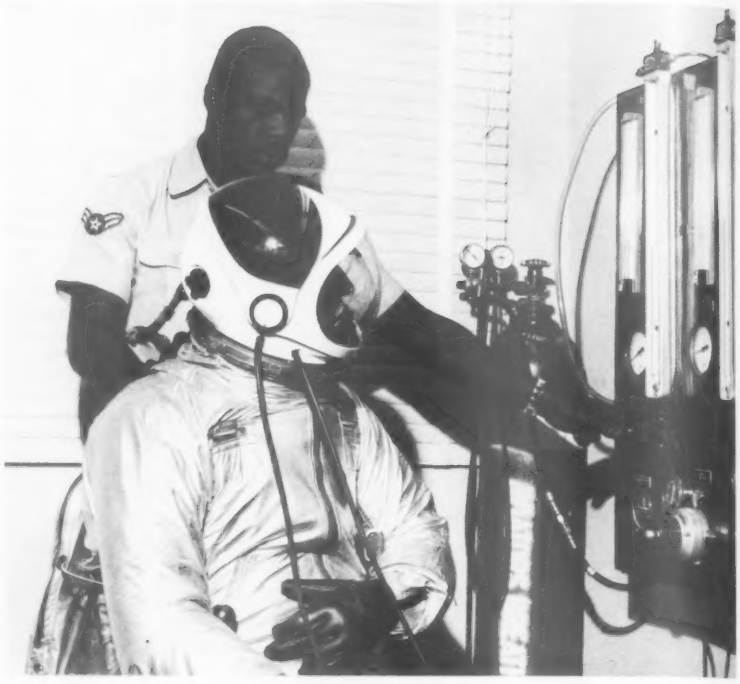
In the past few months, members of that CAP group have utilized this piece of equipment as a vehicle for the training of their counterparts of the 1001st Civil Engineering Group at Andrews AFB, Md.

Additionally, the unit has offered to make the novel vehicle available to Andrews AFB firefighters whenever its unusual characteristics can be used profitably.

HUSTLER ARRIVES

SAC's first 12 *Hustler* bombers were recently delivered to the 43rd Bomb Wing at Carswell AFB, Tex. Simultaneously, that unit accepted the responsibility for a new threefold mission—combat, crew training, and operational evaluation.

As soon as the unit has completed its conversion to the new Mach 2 bomber, additional units will begin transition to the B-58s. Scheduled to be second is the 305th Bomb Wing, Bunker Hill AFB, Ind. However, for the immediate future, SAC will continue to train all its *Hustler* crews at Carswell.



JUST AS ROCKETS have reached the second generation so, too, have space suits. At Edwards AFB, Calif., Capt. Ralph Richardson undergoes initial testing in an A/P-22S full-pressure suit with A2C Clarence Brantley at the controls. Eventually, this suit is expected to replace the present MC-2 suit which pilots have been wearing in such high-altitude tests as the X-15 flights.

BITS OF BLUE

. . . The Air Force Academy stadium fund received an unexpected donation recently. Col. Wan Joong Yoon, Vice Commander, Air Command and Staff College, Republic of Korea Air Force, made the presentation on behalf of the cadets at the ROK Air Force Academy. He is currently undergoing Mutual Assistance Pact training in the U. S.

. . . Lockheed has opened a new multi-million dollar avionics lab at its Marietta, Ga. facility. The lab is designed to improve research, development and testing of antennas, radomes, and electronic transmission lines and components for high-speed and special mission aircraft of all types.

. . . USAF has authorized construction of several additional *Bomarc B* launchers for two of its east coast bases. McGuire AFB, N. J., will add 28 to its current total of 56 and Otis AFB, Mass., by also adding 28, will double its present capacity.

. . . Officials at Tyndall AFB, Fla., recently announced that two units have scored perfect firing days for the first time since adoption of the flight deployment concept. The high-scoring pilots represented the 62d Fighter-Interceptor Squadron, K. I. Sawyer AFB, Mich., and the 322d FIS, Kingsley Field, Ore. Pilots of both units were flying F-101 aircraft.

. . . Construction of residential-type bachelor officer's quarters for 20 men has been approved for Minot AFB, N. Dak.

. . . USAF's *Minuteman* Mobility Test Train has completed its initial test program. Because of the accelerated success of these runs, the program was reduced from six to four trips.

SUPERSONIC TARGETS

USAF has solved one of its most perplexing problems—that of affording air-to-air missile firing practice at targets towed faster than Mach 1.

At Edwards AFB, Calif., 16-foot-long, missile-shaped targets have been towed at speeds up to Mach 1.4.

Changes in the older methods of towing targets included extension of the tow cable to 7.5 miles in length. Further it had to be "stepped"—that is, gradually reduced in size—to permit more cable to be wound on the reel drum and to reduce drag on the tow aircraft.

The target itself carries radar beacons and contains two types of scoring devices. Additionally, it is automatic, refastening itself to the pylon after being reeled in, and can be used repeatedly, thus reducing costs which surround the use of drones. In the event the tow cable is cut during a mission, a parachute provides for emergency recovery.

MODIFIED PLIERS

A simple modification to a pair of $1.50 pliers promises to save thousands of dollars annually.

Extreme difficulty has long been experienced by specialists Air Force-wide who are called upon to reset overload protectors of motor coupling shaft assemblies on specialized aircraft equipment. Often such adjustments resulted in equipment damage necessitating replacements and which totaled more than $1,000 annually at Laughlin AFB, Tex., alone.

A2C Robert C. Archey devised a simple modification to the pliers in his kit. The improvement has resulted in the capability of performing the necessary task in seconds without danger of damage.

His suggestion has been forwarded to major headquarters for consideration and may soon be available to specialists USAF-wide.

ETHIOPIAN STUDENTS

The Tactical Fighter School at Luke AFB, Ariz., will graduate its first four Ethiopian students this month after completion of an intensive 13-week course.

Prior to their arrival at Luke, the four underwent a six-week course in language training during pre-flight schooling at Lackland AFB, Tex., and six months' basic pilot training at Reese AFB, Tex. They arrived at Luke as qualified T-33 pilots. Their final course consisted of additional T-33 instruction and advanced work in F-86 fighters.

Instructors of Luke's 4517th Combat Training Squadron are also currently conducting training for representatives of the Air Forces of Denmark, the Republic of West Germany, Iran, the Republic of South Korea, Pakistan, Turkey, Norway, and Venezuela. Additionally, they are also responsible for training U. S. Air National Guard pilots in tactical fighter techniques.

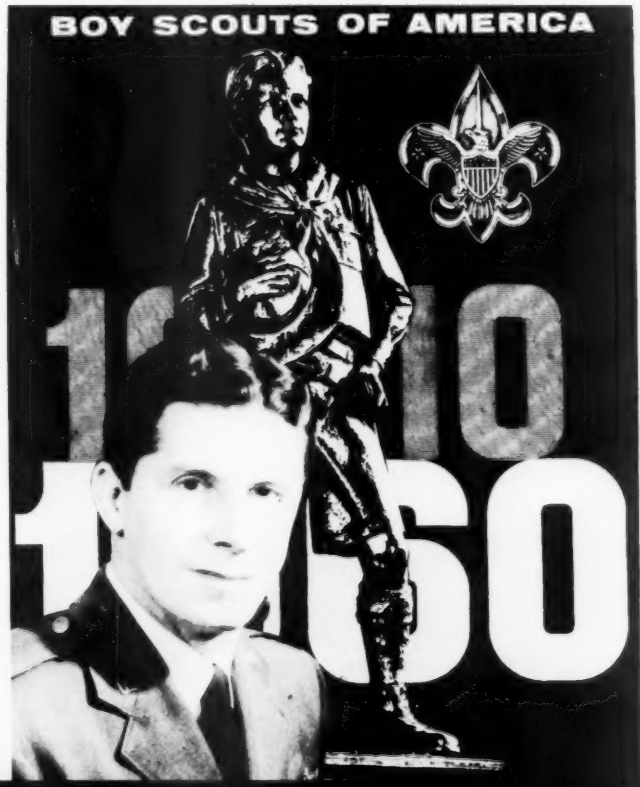
NEW DECORATIONS

USAF now has three decorations which are strictly Air Force. Joining the two-year-old Air Force Commendation are the recently approved Air Force Cross and the Airman's Medal.

The Air Force Cross provides USAF with a decoration which will replace future Distinguished Service Cross Awards and will be available only during wartime. The Airman's Medal replaces the Soldier's Medal. Criteria for awards are unchanged.

However, personnel officials stress the fact that while these new awards were approved on July 6 and that awards after that date will be of the new design, the decorations will not be available until after development of the new designs has been completed and coordinated through several agencies. Consequently, they will probably not be available until sometime in mid-1962.

THIRTY YEARS AGO, the now-famous bronze figure which represents the Boy Scout movement in the United States was cast in Philadelphia, Pa. Model for the famed statue was Robert Crawford, presently Maj. Robert Crawford, Intelligence Officer of the 51st Fighter-Interceptor Wing, Naha AB, Okinawa. A former Eagle Scout, he is now a member of the Executive Board of the San Fernando, Calif., Council, BSA, with over 32 years of scouting activity.



EDITOR'S NOTE: *Mabel Christina Crane, author of the poem* Interrupted Flight *is the mother of two Air Force pilots who lost their lives in performance of duty. Lt. Gary William Crane was killed in an aircraft accident at Stewart AFB, N. Y., in October, 1958. His only brother, Capt. John Richard Crane, assigned as narrator for the Thunderbirds, met with a tragic accident on July 27, 1960, near Nellis AFB, Nev. The poem, dedicated to Dick and Gary, expresses the mother's faith in the wisdom and omnipotence of God.*

INTERRUPTED FLIGHT *To Dick and Gary:*

His days were spent in keen delight
In each minute detail
He loved each shining glorious hour
And misty vapor trail.

Then—Silver wings were turned to gold
By a touch of the Master's hand
Earthly bands were swiftly shed
For a promising life—well planned.

Silver flashing streak of light
With a roar you're out of sight
Yet a Mother's heart is there
Silent in her fervent prayer.

Flashing guns and burst of speed
For our Country's urgent need
He is brave and trained to fight
But—bring my son home safe tonight.

The mind is weak and fails to grasp
The beauty of your flight
But wings of gold proclaim the truth
Of God's eternal right.

Wheel and soar in skies of blue
Whisk through clouds of light
Nature's fury holds no fears
For this—Your Golden Flight.

—MABEL CHRISTINA CRANE

NEW NAVIGATION RADAR TRAINER

SAC plans to begin using a new navigator radar trainer in its B-47 and B-52 units this month.

The new simulator has been designed to keep navigators abreast of technological advancements in aerospace programming. These advances are expected to carry SAC crews to the fringes of space in the not-to-distant future, and the new simulators are designed to reproduce conditions which will face these men. As an example, target complexes will be simulated at altitudes ranging from sea level up to 100,000 feet and as far as 2,000 miles away.

New simulators will be installed at each SAC base utilizing these aircraft and at ATC's Mather AFB, Calif., where all USAF navigators obtain their initial training.

Similar trainers have been purchased and will be placed in operation at B-58 bases as they are equipped with these advanced bombers.

GENERAL ELECTRIC'S J-93 turbojet, proposed powerplant for the Mach 3 B-70 Valkyrie, is undergoing airborne testing designed to answer questions which are not solvable through normal methods. The double-Mach B-58 Hustler will serve as the test-bed vehicle with its engines throttled back from normal power settings during the operational program which includes investigation of air starts, transient control, and afterburning. The engine will also be checked for ground-handling characteristics.

HIGH-SPEED aircraft tires, developed by Goodrich, and considered "too advanced" only a decade ago, today are being utilized as standard equipment on USAF's X-15 experimental airplane. The tire tread is laminated with multiple plies of nylon which bind the tread to the tire carcass thus preventing centrifugal force from stripping it off at high speeds.

Aerospace Library

Historical

Arch Whitehouse has authored an excellent new book titled *The Years of the War Birds,* recently released by Doubleday and Co. It serves as a fine companion piece to his earlier *The Years of the Sky Kings,* and retails at $4.95.

Random House has released *Memoirs of World War I: From Start to Finish of Our Greatest War,* by Brig. Gen. William Mitchell, ($4.95). It is based on the extensive diaries the general maintained during this nation's participation in WW I, and is laced with reports on such men as Frank Luke, Eddie Rickenbacker, and other top war aces.

Fighter Aircraft of the 1914-1918 War is a detailed presentation of the aerial hardware utilized by all the nations participating in WW I. Released by Harleyford, Letchworth, Herts of England, the reference work is edited by E. F. Chessman, ($8.50).

Werner Baunbach scoured official files and called extensively upon his personal experiences in compiling *The Life and Death of the Luftwaffe,* a comprehensive history of the German Air Force of WW II. It has been released by Coward-McCann, ($3.95).

Related Reading

Wind on My Wings, Percy Knauth, Doubleday and Co., ($3.95), is something a little different in air writing. Author Knauth has compiled his book on the basis of notes taken from a student pilot's flight log.

One of the leading military analysts of the day, B. H. Liddell Hart, has taken a comprehensive look at western defense capabilities and gathered his conclusions in *Deterrent or Defense,* Frederick A. Praeger, Inc., ($4.95). His area of concentration is most concerned with the state of NATO.

For the Teens

Generally classified as "for young Americans," *Countdown, The Story of Cape Canaveral,* actually will have a wider appeal than that. Released by Little, Brown and Co., ($3.50), it is styled as a record of the many firings from this famed Florida base.

Joseph N. Bell has woven a fascinating story of the famed astronauts into a fast-moving account of their training and backgrounds and the development of the capsule which will carry them into space in his *Seven Into Space,* Popular Mechanics Press, ($3.95).

You Ask It

I have heard rumors recently that the WW II G. I. loan program has been extended. Can you confirm this and, if true, for how long is the extension?

These "rumors" are true. The application period has been extended for two years.

Has the extension affected loan interest rates?

No. The maximum allowable rate is still 5½ percent.

I understand that the revised law also calls for a direct loan program. What is this?

Direct loans can be made to veterans who live in designated rural and small-town areas where G. I. loans are not available from local lenders.

I will soon be discharged and would like to begin immediate training under the Korean G. I. Bill. Can the VA offices in Washington supply me with a list of all courses presently approved for veterans?

No. Each regional office maintains a list of State-approved courses; therefore, you should contact the regional office where you intend to pursue your training courses.

I expect to be discharged in time to enter college for the spring term. Under provisions of the Korean G. I. Bill, how soon can I expect my first allowance from VA?

Not until after you have been in school about two months. Payment can be made only after the first month's training is complete, and then it takes approximately three additional weeks to process checks.

Before beginning this training, may I also apply for VA vocational counseling to assure that I am taking courses which correspond to my aptitudes?

Yes. When you make your application to VA, indicate that you want such counseling, and they will schedule an appointment for you.

If I take a part-time job while going to school under the G. I. Bill, will those earnings affect my allowance from VA?

No. They do not even need to be reported.

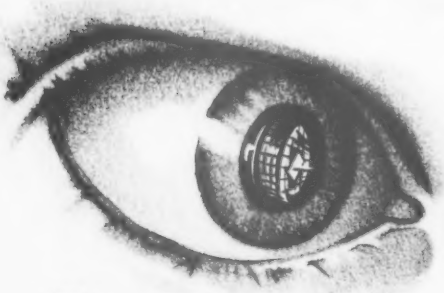
If I should have to take time off from classes, will my G. I. school allowance be reduced?

Only if the number of days you are off exceeds the number permitted by the school you are attending and the State Approving Agency.

The beneficiary I originally named for my G. I. insurance recently died. What must I do to name a new one?

Simply fill out a change-of-beneficiary form and return it to any VA office. They will do the rest.

One eyewitness is worth more than ten who tel



eyewitness..

Through the eyes of Tiros and future meteorological satellites, man will watch the world's weather unfold.

by Capt. Theodore R. Sturm, (USAF Ret.), *Airman Staff*

IN LATE June of this year, Brig. Gen. Norman L. Peterson, Commander of Air Weather Service, stood before a meeting of more than 300 NATO commanders gathered at SHAPE headquarters just outside Paris.

It was a significant time for the world; the phenomenally successful meteorological satellite called *Tiros I* had entered its near-perfect circular orbit of the earth less than three months past. Its useful life had ended a few days before, on June 18, but its 22,953 individual pictures of cloud cover over the globe continued to elate meteorologists who were to pore studiously over their details for many months to come. Across the nation, and indeed the entire world, *Tiros'* unprecedented revelations gave rise to predictions ranging from cautious optimism to unrestrained fantasy.

Thor-Able *with* Tiros *blasts from Cape Canaveral.*

General Peterson's summary statement, although itself of a prophetic tone, sounded a leveling note in the rising crescendo of international speculation.

"Equipped with an advanced system of meteorological and other reconnaissance satellites," the general commented, "the commander of a few years hence will enjoy a vision of the global battlefield which has until now been reserved for the historians."

His audience, viewing the display of *Tiros* pictures which portrayed the very area of operations with which they would be concerned should war erupt, could only agree with him. There, in photos taken in April, was a band of clouds which originated over the Abyssinian Highlands and blanketed the Red Sea. Northwestward, the Sinai Peninsula lay bare and clearly discernible. A portion of the ancient Nile stood in stark relief where it curved south of Cairo and ahead, the eastern Mediterranean was visible under clear skies, while much of Turkey, Syria, Lebanon and Israel was obscured by the clouds. Across the Sudan, cirrus clouds revealed the presence of a jet stream. Expansive swirls showed a storm in the North Atlantic.

These characteristic pictures of great, spiraling cloud masses showed brightly against the darker background of sea and land areas. They bore silent, irrefutable corroboration of General Peterson's earlier statement. "The ability instantly to determine weather conditions over vast reaches of enemy territory or of ocean or desert will revolutionize many of our present day concepts of warfare."

To the Air Force mission, this is the real significance of the National Aeronautics and Space Administration's *Tiros I* and future, operational weather satellites. Beyond the obvious ability to "see" the weather over target areas, the increased accuracy satellite data brings to forecasts will reflect in every phase of wartime and peacetime operations—the refueling missions of SAC and TAC, the daily global flights of MATS, rescue

tell what they have heard Plautus: *Truculentus c. 190 B.C.*

operations, flight planning and a host of other everyday functions in which weather is of prime importance.

In fact, *Tiros I* had been in orbit less than two months when ship reports indicated a developing disturbance in the Caribbean. Normally, this would have meant the dispatch of a weather reconnaissance aircraft to determine if a full-blown tropical storm was in the making. Instead, *Tiros* photographed the area, and meteorologists, analyzing the cloud and circulation pattern, were able to say the disturbance would not develop into a storm. One reconnaissance mission was saved—and another misconception was born. The hastily reached conclusion by many who were uninformed was that satellites would put an end to weather reconnaissance by manned aircraft.

But Air Weather Service clarified this mistaken impression. In a letter dated June 1, General Peterson explained the difference between "satellites and manned, instrumented aircraft as vehicles from which weather observations are made."

The letter emphasized that the two systems are almost ideally complementary; that satellites do not in the least compete with the reconnaissance aircraft, but rather free them from routine sentry duty for more important and more productive tasks.

There were other instances where the data from *Tiros* had an immediate effect on operations, but as U. S. Weather Bureau and AWS personnel point out, they were largely a matter of chance—a set of happy circumstances which resulted in the appearance of storm pictures coincidental with an immediate operational requirement.

Only an Experiment

That there were *any* instances of practical usage of *Tiros I* data is in itself a remarkable tribute to the success of the experiment. Its sole purpose was simply to determine whether it was feasible to take television pictures from 400 miles up. Until *Tiros,* the only data obtained similar to what the satellite produced were from *Atlas* shots over the Atlantic Missile Range. These photos were of little value for global meteorological purposes because the area of coverage was limited and the observation period was short. But the shots did lift weathermen's eyebrows as they contemplated the potential use of the same type of coverage from cameras in orbit.

Tiros' success led many laymen to believe that it was one step from an operational weather satellite; that it was, indeed, an operational prototype. This is not true, nor is it true for *Tiros II,* scheduled to be launched this fall. Launching of the first operational prototype still lies sometime in the future.

The misconception of *Tiros'* purpose prompted some observers to remark that the U. S. Weather Bureau and Air Weather Service had been caught, so to speak, "napping at the switch," because no system for immediately furnishing *Tiros* data to using agencies had been established.

It is true that no *operational* system had been implemented, because nobody knew what kind of data *Tiros* would produce, or if it would even be usable. Yet despite the unexpected deluge of high-quality, revelatory pictures inundating the readout stations at Ft. Monmouth, N. J., and Kaena Point, Hawaii, the USWB, AWS, and the U. S. Navy Weather Service did, according to plan, transmit much of the data to using forecasters.

Rapid transmission was complicated by several factors, not the least of which was the lack of frequent free periods on facsimile circuits. As Maj. James Jones, the AWS representative who works with the USWB's meteorological satellite section, explained, the highly taxed communications networks — particularly the weather net serving the Air Force—could not stand idly by waiting for data the value of which was highly conjectural. Thus, information reaching the field was on the average of 10 hours old.

"Now that we know what to expect, and as the meteorologists of AWS, USWB and the U. S. Navy learn more of what these pictures mean, we can program our communications facilities to handle them."

This is precisely what Capt. Dan Lufkin, a meteorologist assigned to the Scientific Service Directorate of AWS headquarters, is working on. Since April 1, he has spoken scarcely a sentence that didn't include the name *Tiros.*

"Our problem is to boil down several satellite pictures into one chart that will include everything significant and lend itself to immediate transmission to all of our weather stations.

"It takes about 10 hours to transmit one orbit's worth of facsimile pictures. With the bird circling the

. . to weather

globe once every 99 minutes, you can see why fast readout and condensation of the data are important."

He revealed that in one day, the data amount to about three *Gone With the Winds*—an apropos example for several reasons.

"Try boiling down three novels this size so that you can transmit everything pertinent in 10 minutes over a facsimile machine and you get an idea of what we're up against. But we're sure it can be done without throwing out more than half the babies with the bath water."

Under the ideal system, as Air Weather Service sees it, meteorologists would be stationed at two readout stations preferably located far north, say in Greenland and Alaska. When the pictures are received from the satellite they represent a perspective view of the curved surface of the earth, and must therefore be put through an electronic distortion remover which converts them to one of the standard map projections.

The team of meteorologists would then examine the pictures and diagnose, on the spot, the weather patterns. They would prepare a schematic diagram of the cloud distribution and organization, include certain pictures of unusual, important or exceptional cloud formations, and send the works to all forecasters in the field via facsimile transmission.

Forecasters could use the material immediately, improving local and enroute forecasts to an extent never before possible to achieve. Through the normal coordination with dispatches and operations people, significant weather developments which might complicate air-to-air refueling and other flights already in progress, could be transmitted directly to pilots. But these are future plans, dependent upon the results of a great deal more research and development.

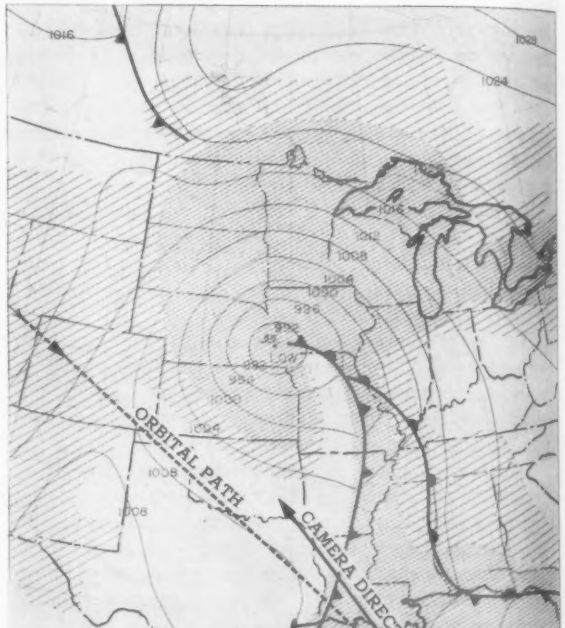
Pictures of cloud patterns seen by *Tiros I* required about an hour for development, but rapid processing of *Tiros II* photos will prepare them for analysis in about five minutes. Thus data from the second *Tiros*, reduced and in useable form, are expected to be in the hands of Air Weather Service and USWB forecasters as quickly as are present conventional weather observations.

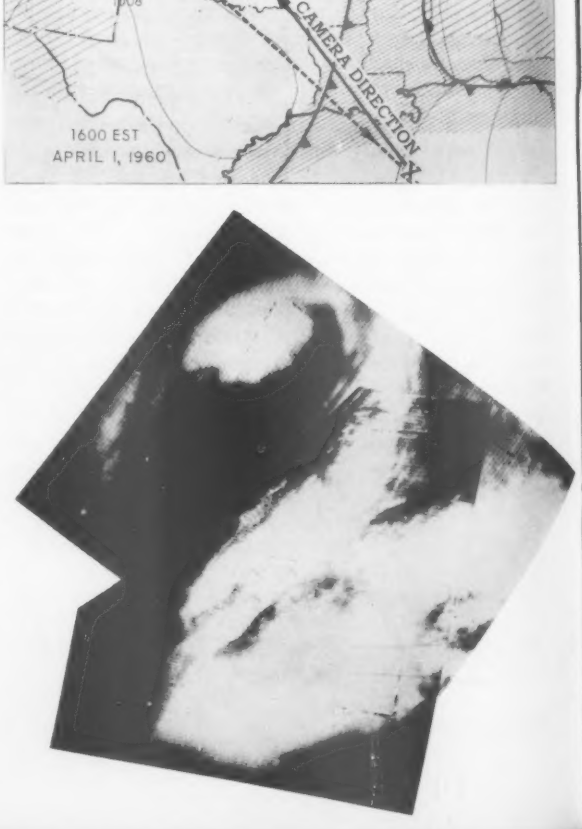
Joint Effort

If any national project could be cited as the epitome of unified effort, *Tiros* might well qualify. It was developed and produced by the Astro-Electric Products Division of the Radio Corporation of America, for the National Aeronautics and Space Administration. The project is under the technical direction of the U. S. Army's Signal Research and Development Laboratory.

Its design is credited to an *ad hoc* Committee on Meterology, which was established in June 1958 by the Advanced Research Projects Agency (ARPA). The committee included, among its many specialists, representatives from the Rand Corporation, Army Ballistic Missile Agency, Office of Naval Research, U. S. Army Signal Research and Development Laboratory, National Advisory Committee for Aeronautics, Air Force Cambridge Research Center, U. S. Weather Bureau, University of Wisconsin, and RCA.

Although funding and overall systems-management control was initially provided by ARPA, these respon-





Well-defined low pressure area matches that of the typical weather map. Notice how the swan-shaped cloud pattern, starting at the top of the Tiros *photo, looks like a swan's head, neck and body. The corresponding weather map, drawn from normal observational data, indicates only inferred areas of cloud.*

sibilities were transferred to NASA in April 1959. As overall systems manager, NASA was and is responsible for the satellite launchings accomplished through the USAF Ballistic Missile Division and its contractors. Launch vehicle for *Tiros I* was the reliable workhorse of the space age, the Air Force's *Thor-Able*.

The name *Tiros* is short for television and infrared observation satellite. It weighs 270 pounds—heaviest satellite put in orbit by the U. S. as of its launch date—and it has been described as looking like a hat box or the air cleaner on a late-model automobile.

Its two TV cameras viewed the earth 30 percent of the time between the latitudes of 48 degrees north to 48 degrees south—roughly between the southern tip of Argentina and the northern tip of Maine. The camera that took most of the pictures received uses a wide-angle lens that snaps a photo of an area about 800 miles square, and can distinguish cloud elements larger than about two and a half miles in size. The second camera saw an area only 80 miles square, distinguished clouds but a few hundred yards across, thus providing meteorologists a more critical look at significant cloud patterns.

Return to the Past

The most striking revelation, according to Dr. F. W. Reicheldoerfer, chief of the U. S. Weather Bureau, came in pictures taken of the spiral cloud formations associated with large storms. Some of these spiral formations viewed by *Tiros I's* cameras were more than 1,500 miles in diameter.

Dr. Harry Wexler, USWB's Director of Meteorological Research, said the cameras gave meteorologists "the first proof that a large percentage of such storms (spiral) . . . have a banded structure." He pointed out that radar in WW II revealed tropical storms to have bands of clouds spiraling around a center rather than a solid cloud mass rotating around the center. *Tiros* proved that clouds outside the tropics have the same type of structure.

For weathermen this represents somewhat of a paradox in the history of forecasting—a return to the nephanalysis or cloud analysis of early days occasioned by the latest technological achievement of our new scientific age. Nephanalysis was the mainstay of forecasting in the 19th century when weathermen were largely concerned with local area forecasts. They could get a fair indication of tomorrow's weather by noting the shapes and types of clouds hovering on the evening horizon. But as communications developed, and the air age was born it was obvious that local weather forecasts wouldn't satisfy the transportation need at all. A man can see cloud formations only within a radius of a few miles. Thus the establishment of observing stations throughout the world, regularly reporting over newly developed communications nets the state of the atmosphere at any given place, provided factors of temperature, barometric pressure, wind, humidity, cloud heights and types, and precipitation.

Weathermen leaned heavily on the isobar system of map analysis. By connecting points of equal pressure and correlating the other observed weather factors, it was possible to draw a map showing areas of low and high pressures, winds, precipitation, frontal systems, and other pertinent elements.

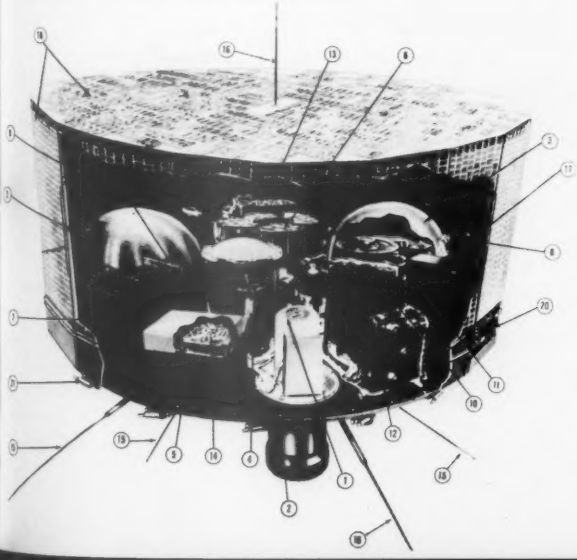
From applied principles of physics and the scientific knowledge accruing steadily to meteorologists, forecasters could analyze the charts and come up with fairly accurate forecasts. Radar, radio, ceiling lights and other technical aids further refined the science, but they were largely aids to the basic system. Under this system of forecasting, clouds were a secondary source of information, seldom if ever primary. Until *Tiros I*, weathermen had never seen the pattern of the world's weather from above.

Cloud distribution rapidly gained in importance to USAF forecasters as the techniques of aerial refueling were perfected and used regularly on operational missions. Forecasters were faced with the task of *inferring* the cloud distribution from surface and upper air observations.

Over many areas where refueling operations take place, observation posts are few and far between. And even in areas where the observation net is dense, the observer's view is limited. Thus the satellite, with its panoramic view of the cloud distribution and organization, leaves little if anything for the forecaster to infer.

General Peterson recently told THE AIRMAN that meteorological satellites are one of the two major de-

Tiros I, *containing two TV cameras, took still pictures of the earth's cloud cover and transmitted them to ground stations.* Photo keys: *1. One of the two half-inch Vidicon TV cameras; 2. Wide-angle camera lens; 3. Tape recorders; 4. Electronic timer for operational sequencing; 5. TV transmitter; 6. Chemical batteries; 7. Camera electronics; 8. Tape recorder electronics; 9. Control circuits; 10. Auxiliary controls; 11. Power converter for tape motor; 12. Voltage regulator; 13. Battery charging regulator; 14. Auxiliary synchronizing generator for TV; 15. Transmitting antennas; 16. Receiving antenna; 17. Solar sensor to measure position of satellite with respect to sun; 18. Solar cells; 20. Despin mechanism; 21. Spin-up rockets.*



velopments in meteorology since the Norwegian air mass theory. The other, he explained, is the electronic computer.

"At the present time," he said, "the satellite data are a supplement to those data received by normal observations, but future satellites will change all this. What they will see is what you will hang your forecasts on."

As dreams are the stuff satellies are made of, some of the futuristic thinking of meteorologists represents a pretty accurate prognostication of what tomorrow might bring. One meteorologist for example, sees future orbiting satellites making observations three or four times a day over the entire earth.

"They will provide reports on even slight changes in the atmosphere. Their equipment will be able to focus on a particular area of interest through steerable cameras. I believe there will be many semi-automatic ground observing stations, providing displays in conjunction with the satellite data, the combined information being fed through linked communications facilities which will provide long-range, high-speed weather observations to all using agencies."

Engineers are even now designing a satellite camera to turn out a picture a minute, broadcasting directly to receivers located in weather stations so that the forecaster could, by simply turning on his TV set, look over half of a continent. Infrared cameras may even make possible night views of the earth's cloud cover, although they would of course be less well defined than daylight pictures.

The net result of all of this would be a closer rapport between the forecaster in the field and the atmosphere from which he draws his conclusions.

In the final analysis, the human forecaster is still the essential key. In nephanalysis, this is more true than ever before. Although computers can store, relate and assimilate data, they cannot analyze the patterns of a shifting, complex mass of gas that is the atmosphere in which we live. Good forecasters, though, seem to have a sixth sense, a feel for their job that transcends the academic application of facts and figures—something like the difference between a musician and a player piano. The latter may play the exact notes, but a musician becomes part of the composition, extracting all that the composer put into it.

Forecasting is not an end in itself. Its ultimate purpose is the easing of mankind's battle against the elements. Should the day ever come when long-range forecasts can be made with complete infallibility, it may well be considered as the greatest blessing humanity has ever received from science. To this end *Tiros I*, its inevitable offsprings and the men who make them possible are eternally dedicated.

Description of *Tiros I* (1960 Beta)

MAJOR OBJECTIVE: Test of experimental television techniques leading to eventual worldwide meteorological information system.

MAJOR RESULTS: Successful launch into near-circular orbit; video system relayed thousands of pictures containing cloud-cover photographs of meterological interest.

LAUNCHED: 6:40 a.m. EST, April 1, 1960.

FROM: Atlantic Missile Range.

LIFETIME: Estimated 50-100 years.

Flight Program

LAUNCH VEHICLE: *Thor-Able*. Stages: (1) Modified USAF *Thor* IRBM; (2) Liquid engine modified from *Vanguard;* (3) Solid motor modified from *Vanguard*.

LIFT-OFF WEIGHT: Approximately 150,000 pounds.

DIMENSIONS: 90 feet high, eight-foot base diameter.

PROGRAM RESULTS: Successfully photographed cloud cover over many areas of the world.

PERIGEE: 428.7 miles.

APOGEE: 465.9 miles.

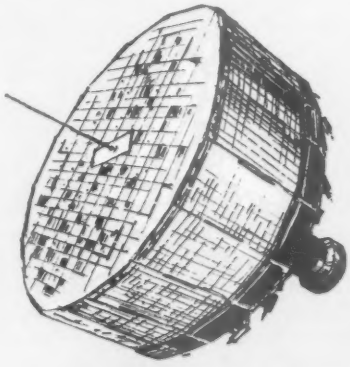
INCLINATION: 48.327 degrees to equator.

PERIOD: 99.19 minutes.

VELOCITY: 24,654 ft./sec. at third-stage burnout.

Payload and Instrumentation

DIMENSIONS: 19 in. high, 42 inches in diameter.



PAYLOAD WEIGHTS: 270 pounds total.

PAYLOAD CONFIGURATION: "Pillbox" shape covered on top and sides by 9,200 solar cells. Three pairs of spin rockets and transmitter antenna surround baseplate. Receiving antenna on top center. Aluminum/stainless steel shell.

INSTRUMENTATION: One wide- and one narrow-angle camera, each with tape recorder for remote operation. Picture data can be stored on tape or transmitted directly to ground command stations.

TRANSMITTERS: Picture information is transmitted by two 2-watt FM at 235MC; two tracking beacons operate on 108 and 108.03 MC with 30 mw output.

POWER SUPPLY: Nickel cadmium batteries charged by solar cells.

SLANTS ON SPACE

Recoverable data capsules, such as some used in the *Discoverer* experimental series, must be able to withstand high re-entry temperatures longer than dummy or practice nose cones of large ballistic missiles in the ICBM-IRBM categories. For the nose cones, re-entry is usually completed in a matter of seconds, whereas with data capsules the process runs into minutes because these devices to date have followed a more gradual return trajectory.

In one re-entry test, telemetry information from a capsule revealed that severe heating and friction effects reached a peak at an altitude of some 70 miles above the Earth's surface when temperatures on the exterior surface of a protective heat shield gave readings in the order of 4,000 degrees Fahrenheit. A thin insulating layer of material on the interior side of the heat shield, however, proved adequate for the protection of the instrumentation and other contents which the capsule carried.

Getting a sophisticated probe out to within a few million miles of the Sun could produce much data that solar physicists are intent on securing in their efforts to learn more about the mechanics of this "average" star which is the dynamo of our planetary system. On an approach that close to the Sun, however, a vehicle would have to be capable of withstanding temperatures in the order of some 5,000 degrees Fahrenheit, or approximately the melting point of the toughest materials now known to be available on Earth for fabrication purposes. This one example explains, in part, the great stress in research fields concerned with the development of progressively more improved materials for space investigation hardware.

Attention parents with space-minded youngsters: Trade sources advise that available in Santa Claus' inventory this year will be do-it-yourself Solar System kits. Assembled, they provide a mobile of the planets in orbit, showing their relative size and distance from the Sun as they revolve.

Mercury, smallest of the major planets, absorbs most of the light it receives from the Sun. Its albedo, or the amount of light it reflects back into space, is a mere seven percent which is approximately the same as the albedo of the Moon. Astronomers are inclined to believe that the surface of Mercury is composed of highly absorbent materials, as in the case of the Moon, which soak up the sunlight. Theories are that this surface is very irregular and rough. Studies have failed to detect any evidence of an atmosphere for Mercury. If one exists it would be thin and composed of only some of the heavier gases. Due to its small mass, the high temperature of the side turned toward the Sun, and a low escape velocity, the planet could not long hold such lighter atmospheric molecules as oxygen, nitrogen and water vapor. Mercury's escape velocity has been computed as 2.2 miles per second, or less than a third of the 7-mile figure for Earth.

Mercury, the planet nearest the Sun, has an unseen or "dark" side for observers, just as is the case with our Moon. The 88 days Mercury takes to complete a single revolution about the Sun is equal to the amount of time it requires to rotate once on its own axis, with the result that one side of the planet is always facing toward the Sun.

Temperature studies of this sunlit side have produced readings in excess of 621 degrees Fahrenheit, or greater than required to melt lead. On the "dark" side, astronomers believe, temperatures of some hundreds of degrees below zero prevail. While optical observations of the planet are difficult, available evidence suggests that physical conditions on the visible side of Mercury are somewhat comparable to those which can be seen on the side of the Moon which always faces the Earth. As radar astronomy advances, scientists expect to develop information on the "dark" side of Mercury by exploring it with electronic pulses.

Mars will come within 56.4 million miles of the Earth on Christmas Day, the closest the two planets will be this year. The distance between Earth and Mars varies greatly, from 34.6 million miles minimum to 234 million miles maximum. This is explained by the fact that the orbit of Mars is notably eccentric, hence the red planet swings really close to us at quite rare intervals which occur some 15 years apart. The last close approach was in 1956.

December 30 will find the Earth and Mars in opposition, astronomically speaking. Two bodies are in opposition when their difference in celestial longitude is 180 degrees. In other words, a planet is in opposition to the Earth when its orbit lines it up on the opposite side of the Earth from the Sun.

Globally, solar eclipses occur at a ratio of about four to three lunar eclipses. However, there are many geographical locations where more eclipses of the Moon are visible than solar ones.

—WILLIAM A. KINNEY

It is for us the living rather to be dedicated here to the

Unfinished Work . . .

Since the turn of the century, the United States has been actively engaged in three wars. When the first of these was formally ended with the signing of the Armistice on November 11, 1918, the nation mourned 53,402 servicemen who died in battle. In addition, 63,114 other deaths were directly attributable to the war in which nearly five million Americans served in the Armed Forces.

In 1926, Armistice Day was established to commemorate the date on which the "war to end all wars" was terminated.

Until December 7, 1941, no other American died by the hand of an enemy nation with which the United States was at war. By the time Japan accepted the Allies' terms of surrender on September 2, 1945, this nation had added 405,399 more names to the century's roll of Honored Dead. More than 291,000 of these were killed in battle. In this war, 16,112,566 men and women served in the Armed Forces.

With its monopoly on nuclear weapons in 1945, and its unprecedented military might, the United States was undeniably the strongest nation on earth. Had such power been vested in a nation with even the slightest motive for conquest, it could have easily accomplished what Hitler and the Axis powers failed to accomplish—conquer the world. But the United States demobilized its forces. Then only five years later Communist North Korea slashed across the 38th parallel in Korea and the U. S. was again engaged in a war against an aggressor. Comprising the largest part of the United Nations' forces assembled to stop the declared aggression, the United States lost 54,246 men of whom 33,629 died in battle. Nearly six million Americans served in the Armed Forces during the Korean Conflict before war ended on July 27, 1953.

Almost a year later, on June 1, 1954, our national Armistice Day, November 11, was renamed Veterans Day to honor all Americans who have served our nation in its Armed Forces.

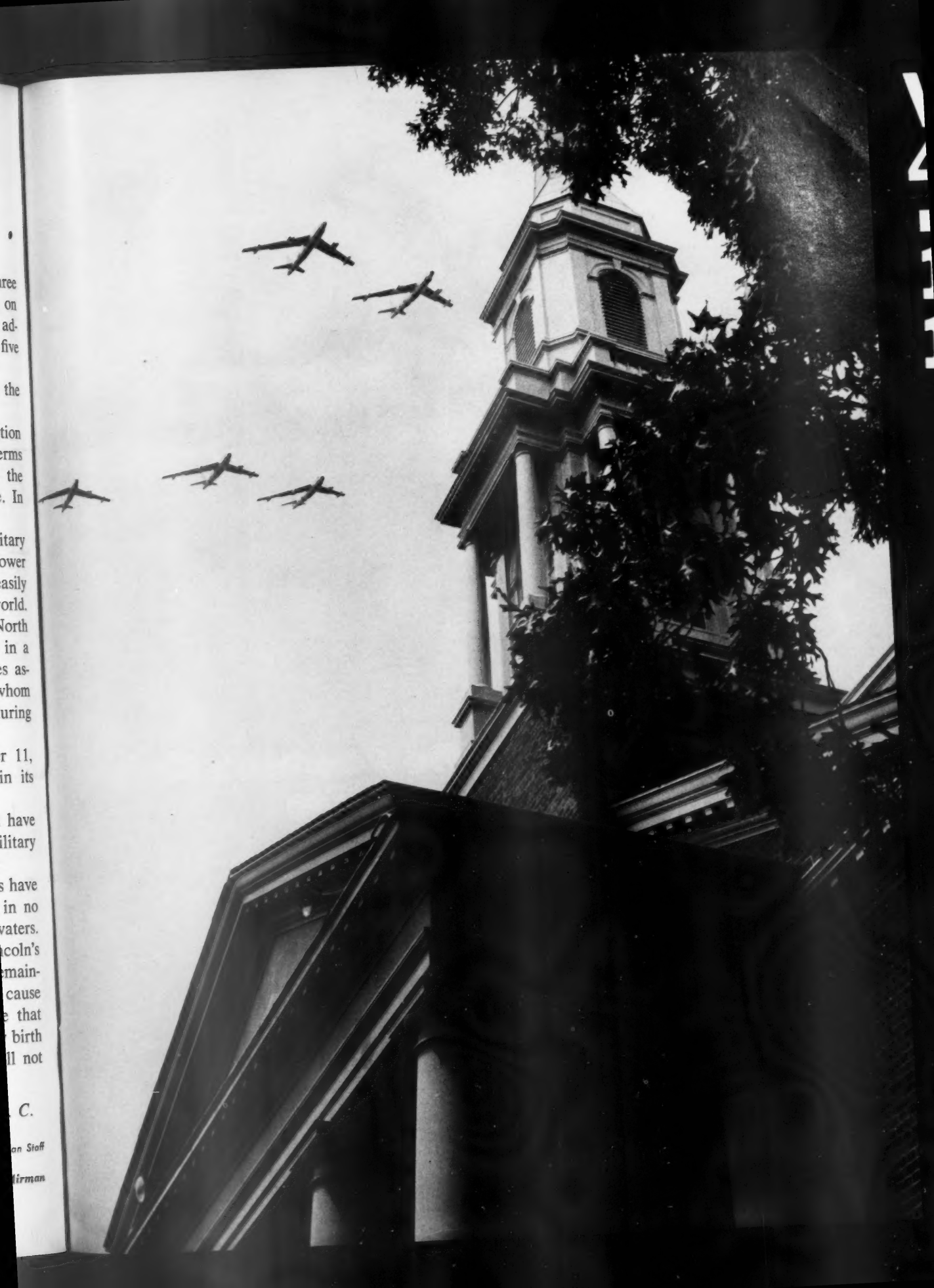
By all the principles of international law and justice, no other names should have been added to the roll of those who had died by enemy action. United States military forces have fought no battles since the Korean armistice.

Yet, in the last ten years, excluding Korea, unwarranted and illegal air attacks have taken a toll of 90 American airmen killed or missing. These men were involved in no hostile or aggressive acts. Many of the planes were unarmed and over international waters.

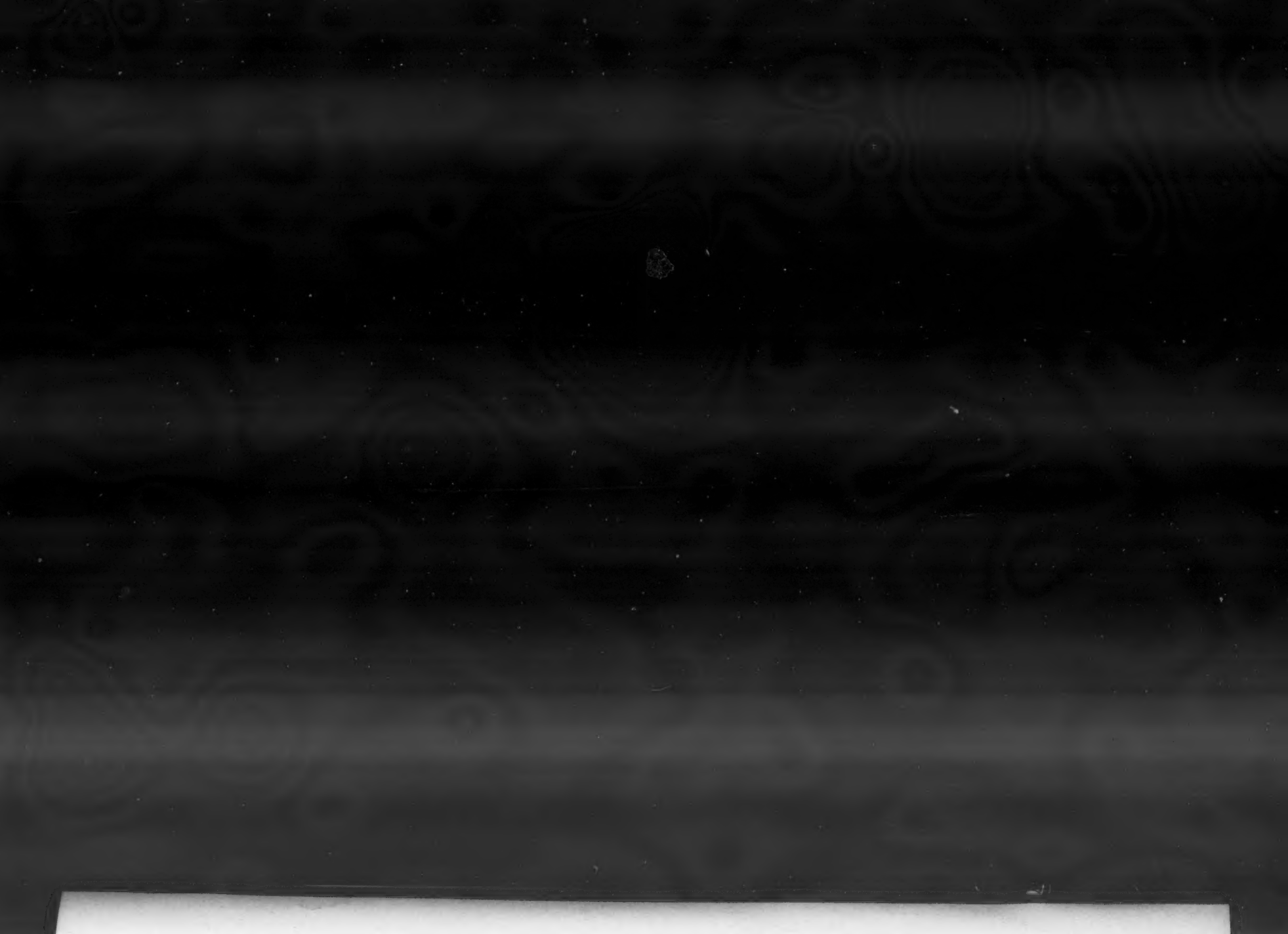
This year as the nation honors its veterans, it is well to recall President Lincoln's immortal words. . . . "It is rather for us to be here dedicated to the great task remaining before us—that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion—that we here highly resolve that these dead shall not have died in vain, that this nation under God shall have a new birth of freedom, and that government of the people, by the people, for the people shall not perish from the earth."

USAF B-47 bombers pass over the chapel at Arlington Cemetery, Washington, D. C.

Photo by SSgt. Ted Gaidelis, *Airman Staff*



The American's Pledge to His Flag

I pledge allegiance to the flag
of the United States of America
and to the Republic for which it stands,
one Nation under God, Indivisible,
with liberty and justice for all.

Section 7, Public Law 623, as amended